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Intestinal Diseases of Infancy and Childhood.

VOL. II.

By A. Jacobi, M. D.

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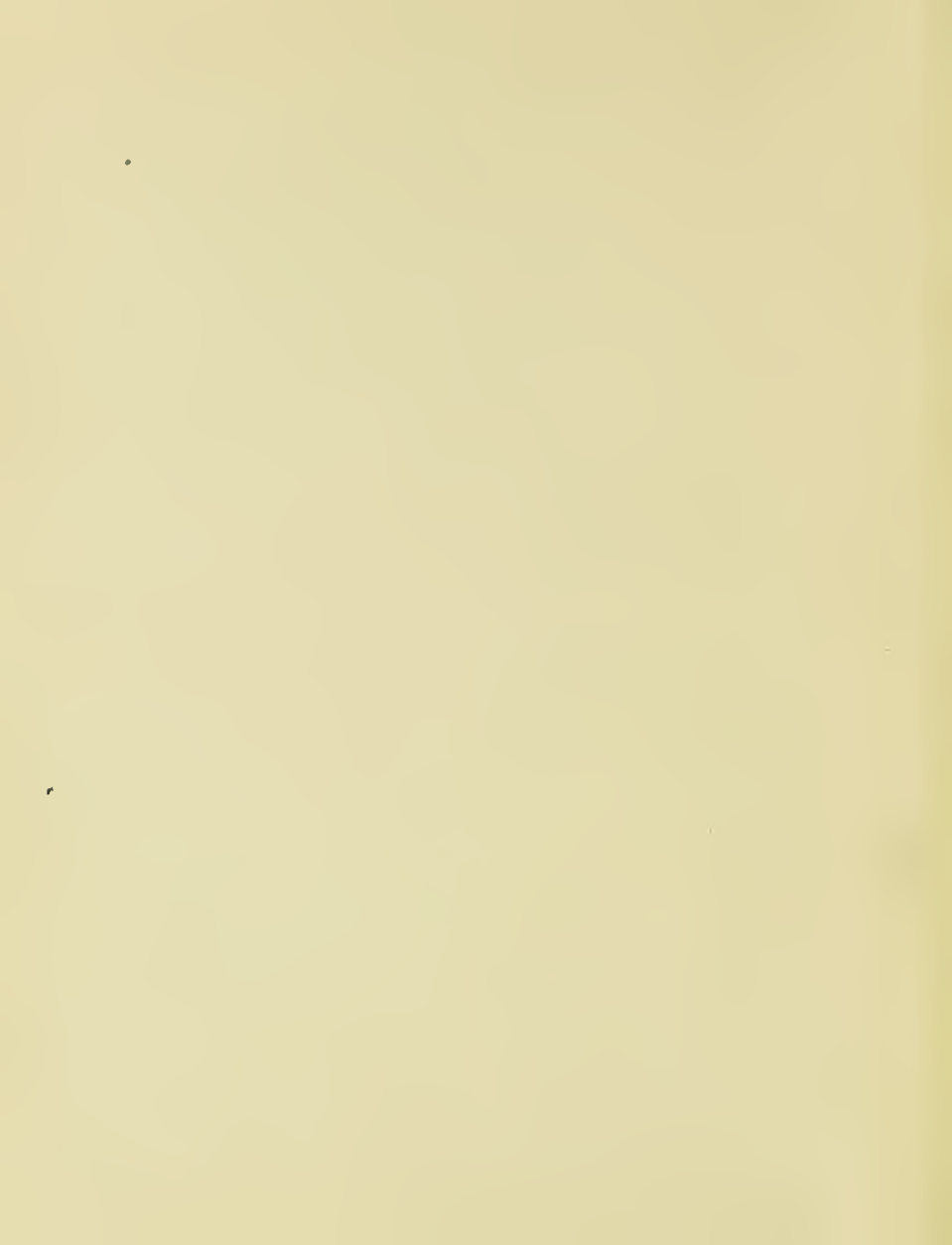
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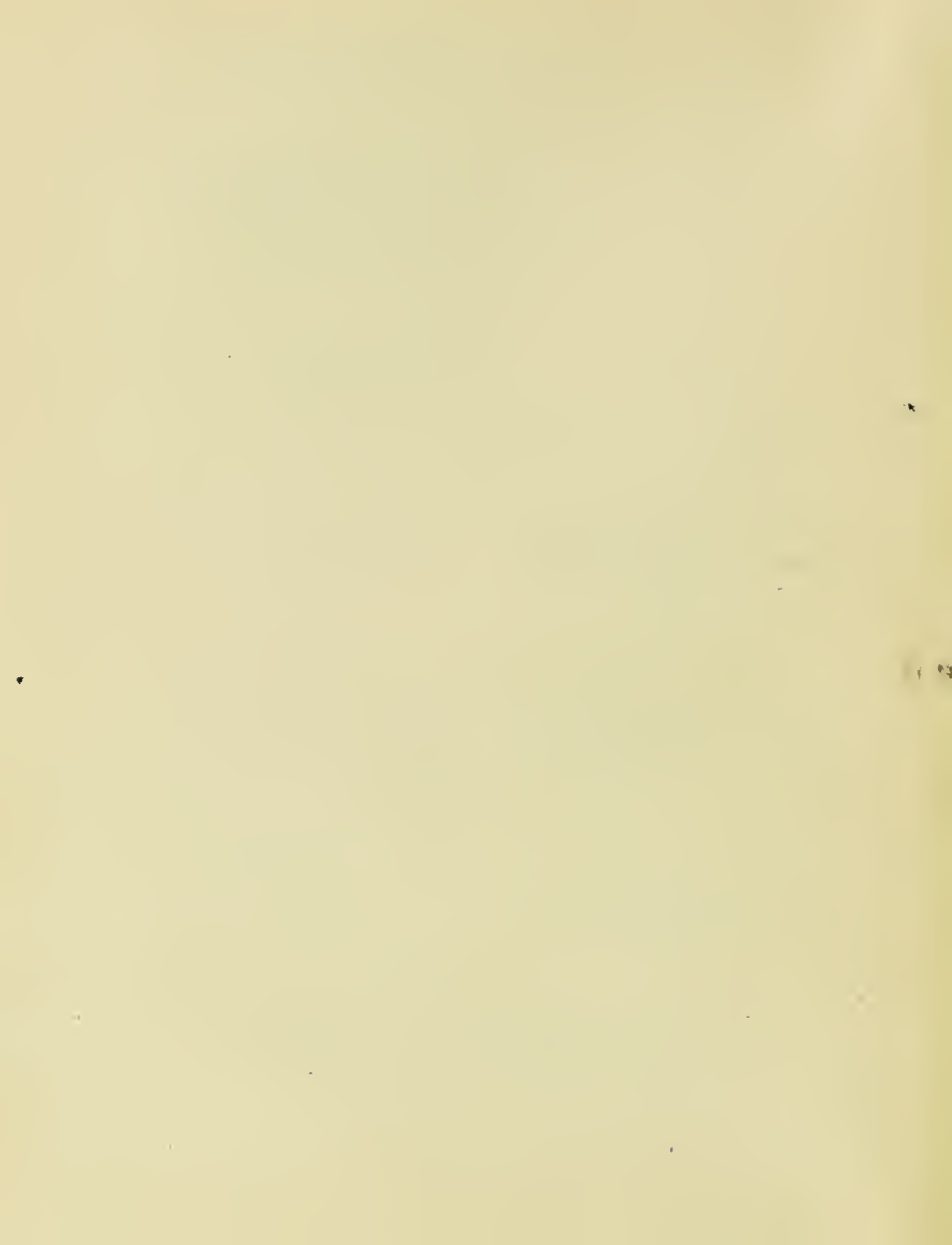
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—THE—

INTESTINAL DISEASES OF INFANCY AND CHILDHOOD.

Physiology, Hygiene, Pathology and
Therapeutics.

— BY —

A. JACOBI, M. D.,

Ex-President of the New York Academy of Medicine; Clinical Professor of Diseases of Children in the College of Physicians and Surgeons, New York, etc.

VOL. II.

SECOND EDITION.



1890.

GEORGE S. DAVIS,
DETROIT, MICH

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INTESTINAL DIGESTION.

The stomach expels all cellulose, all starch that has not been changed into sugar, all parapeptones, all dyspeptones resulting from proteinates, and, finally, fat and some salts. Part of these are absorbed, part are digested, and another part expelled either changed or unchanged.

The large intestine does not aid in digestion, though it will absorb some water and soluble substances: and whatever is absorbed in this way, even in a liquid form, either albumin or sugar, is soon eliminated by the kidneys. Thus, whenever injections are made into the rectum for the purpose of sustaining nutrition, the contained sugar and starch also, if possible, should be transformed into glucose, the milk peptonized, and the fat emulsionized. The infantile intestine and its function differ from what we observe in the adult. Lieberkühn's glands exist, but both their number and development are less than in the adult. The villi are generally numerous and large; some assert they surpass in size those found in the adult intestine; the capillaries of the villi, it is claimed, have greater absolute size, to such an ex-

tent that their diameter is larger than that of the same vessels in the adult. Peyer's patches are slightly developed, and not numerous, but their small anatomical development corresponds with their physiological and pathologicoal significance; for, infectious fever, in which the morbid process exhibits itself mainly in these patches (*i. e.*, typhoid fever) as a rule is a mild disease in early infancy, and in the new-born it is almost unheard-of—there is hardly a dozen well authenticated cases upon record; one of the two I have seen was that of a baby attacked when nine days old, who died one week later. It is true, after two or three years, typhoid fever occurs quite frequently, but it is yet, in most cases, mild. This is all that can be said here of the glands of the intestinal tract, for those of the large intestine have no other function than to produce mucous.

The muscular apparatus of the intestine is developed but slightly. The intestinal tract, from the stomach down to the anus, has but little work to do during the whole of fœtal life. According to Zweifel, the contents of the intestinal canal move but very slowly. In a fœtus of three months, the ileum and colon are still empty; at the end of the fourth month there is meconium two centimeters this side of the cœcum; in the fifth month there are a few particles in the colon.

The inconsiderable development of the intestine gives rise to several difficulties soon after birth. Air

which is swallowed, and gas which is developed in the intestinal tract, may be neither absorbed nor expelled, and colic results. Not infrequently the intestinal muscle shows the first symptoms of a general morbid condition, for instance, rachitis, when developed at a very early period in life, is very apt to show itself first in an unusual degree of muscular debility of the intestine, a debility that results in obstinate constipation very early. This intestinal weakness sometimes causes other disorders, for when the copious capillary system is not controlled by powerful muscular contraction, particularly when the muscular layer is thin and liable to be softened by œdema, passive effusion easily takes place. Besides, the nervous system of the infant is very irritable; the ends of the intestinal nerves are paralyzed by heat, irritated by local stimulation, and reflexes can be easily explained by the fact of the insufficient development of the inhibitory centres. Moreover, the formation of acids is very common, and these give rise to laxative salts, and the weakness of the sphincter ani is such that it allows ready discharge without dessication of the fæces.

The secreted mucous is very copious, ferments easily, and acidulates. The alkaline intestinal secretion, the alkaline secretion of the liver, and of the pancreas, becomes easily neutralized, and new acids are formed by putrefaction of what should have been digested.

The length of the infantile digestive tract is un-

expectedly great. According to Beneke, the proportion of the length of the body to that of the small intestine is, in the adult, 100:450; newly born, 100:570; second year,—:660; third year,—:550—700; seventh,—:510.

MECONIUM AND FÆCES.

Meconium consists of water, hair, tallow of the sebaceous follicles of the surface, of epithelium of the epidermis and of the mucous membrane down to the intestinal tract, and of bile. It does not contain bacilli, but they are present from three to eighteen hours after birth, in consequence of swallowing air and the oral secretion. There are no products of putrefaction, and neither indol nor phenol are found; and the same is the case in the first few months of life during normal nutrition. At a later period the lactic-acid bacillus is found in the intestinal tract, provided that milk-sugar is still present. Biedert has found a cocco-bacterium in the colon (Virchow's Archiv., vol. 100), which gives rise to a very faint odor. Altogether, infants fæces are not malodorous. Both of the above bacilli require but little oxygen, of which there is a small quantity in the infant's intestine. Under normal circumstances other bacilli do not thrive. Thus it appears that the entrance of those bacteria is not the cause of diarrhœa.

The number of normal evacuations in the newly-born infant is from three to five at first, from, one to

three later on. Their color is uniformly yellow, whiter when cow's milk, denser when starchy food is given. They are slightly acid, their odor is not unpleasant. In one of his excellent papers (d. Arch. Klin. Med., xxviii, 1881), Uffelmann gives the following account of the microscopical contents of the fæces: A very large quantity of cocci and bacilli, and other fungi, fat globules and fat acid in crystals, protein substances, mucin, epithelia, mucous corpuscles, nucleated cells, structureless bodies, crystallized salts, cholesterin, coloring matter of bile, and sometimes bilirubin in crystals. The yellow color of the fæces is mostly attached to fat globules, fat acid crystals, epithelia, mucous corpuscles and cocci. The fæces consists of small quantities of albuminoids, larger ones of fat, free fat acids, salts, particularly those of calcium, salts of potassium, sodium, calcium, magnesium, iron with chlorine, and phosphoric, sulphuric and organic acids, also mucous, epithelia, cocci and fermentation fungi, coloring matter, cholalic acid, cholesterin, and sometimes leucin and tyrosin. The percentage of water is larger than in the fæces of adults. Next in weight come cocci, epithelia, and mucous. Next fat and fat acid. Next salts. Of the (15 per cent.) solid constituents 1.5 are inorganic, and 13.5 organic. In these, fat and fat acid 2-3, protein 0.2 or less, and cholesterin 0.1-0.2. The normal food of the nursling is digested and assimilated to the amount of 96.5-97.0 per cent. Its protein to

99-100, fat 97-97.9 and salts 89-90 per cent. A part of the protein received reappears in the large volume of cocci and bacilli.

Amongst the micro-organisms the class of the schizomycetæ are numerously represented in the healthy and diseased intestine. Within from four to eighteen hours after birth there are large numbers of bacteria, cocci, bacillus subtilis, and bacterium coli commune (Escherich), the latter in the large intestine, in the remnants of digested milk. Besides there is the bacterium lactis aërogenes, to which is attributed the action of decomposing milk-sugar into lactic acid, carbonic acid and hydrogen, thus giving rise to the intestinal gases.

All these facts show the presence of immense quantities of micro-organisms, prove, however, nothing in regard to the etiology of diseases. The normal state exhibits the same. Besides, in some conditions where the host hazardous bacteriomaniac would not dare to believe bacteria the cause of the ailment, they are found in exorbitant masses. Thus, for instance, in arsenic poisoning, in which the intestinal part is crowded more than in any other condition, with saprophytes of the same class which inhibit the mouth, pass the gauntlet of the stomach's acid, and swarm about the bowels; or is perhaps the disease and death due to the micro-organisms, and the arsenic an incidental encumbrance?

LIVER.

In the young embryo the weight of the liver is one-half that of the whole body; it is large in the foetus; in the adult it is one-thirty-sixth of the whole weight.

Immediately after birth the circulation through the umbilical vein is cut off, but that of the portal vein increases. Thus, though it is very much smaller in the infant than in the foetus, the liver is still very large. The inference, therefore, is that it should have a great influence on, and control of, the digestion of infants. But we know that the secretion of bile depends a great deal upon the presence of intestinal acids; besides, at that early period, the formation of bile is not the principal function of the liver. During foetal life it is that organ which produces sugar, and sugar is as universal in the embryonic tissues as is fat in all the organs after birth. The liver is probably also the seat of the formation of red blood-globules, but its final function is to secrete bile. It is not improbable that the bile in the very young infant is as imperfect as is the secretion of the pancreas, for it consists largely of material destined for elimination, and the quantity is proportionately small; and though the quantity secreted be copious, we must not expect too much effect with regard to digestion. In the very first week, transformation of the coloring matter is taking place; bilirubin is formed, but some of the coloring matter is unchanged; at a later period, the

transformation is complete. In anomalous conditions when the fæces become strongly acid, the bilirubin is transformed into biliverdin. The different colors depend upon the different degrees of transformation, thus there is urobilin, which gives the color to the fæces in adults, and there is also cholesterin, contrary to the opinion of Flint, who believes that cholesterin is transformed in the intestine.

PANCREAS.

The contents of the upper part of the small intestine near the stomach are acid, but all the liquids which control intestinal digestion are alkaline.

The action of the pancreas is of different kinds. It changes starch into sugar, but the quantity of diastatic ferment in very young infants is but trifling; another function is to change albuminates into soluble modifications; and still another is to emulsify fat. The two latter effects have not been observed in infants that died of diarrhœa, hence, it appears that the pancreas cannot be relied upon for any of its functions during severe attacks of this malady. Fat is digested in such a way that it is decomposed into glycerin and fat acids; the glycerin combines with the phosphoric acid and forms glycono-phosphoric acid; and the fat acids form soaps with the alkalies in the small intestines.

Glycono-phosphoric acid contributes to the formation of cells in two ways: first, it forms lecithin, and

second, it enters into the cartilage cells and forms phosphate of calcium from the carbonate it there encounters.

Now, the pancreas performs its function only while the intestinal fluids are alkaline, and this alkaline reaction depends upon the presence of phosphate of sodium. When there is acid in the intestine, the pancreas is prevented from performing its function, and the formation of bone is delayed. But it is not only the bones which lack phosphoric acid in these cases, but the rest of the tissues, particularly the blood and the muscles. This condition, known by the general name of *rhachitis*, is therefore, sometimes, the result of primary absence of phosphates in the food, but very much more frequently of an excess of acid in the intestinal tract sufficient to wash out the phosphoric acid which it meets; thus it is that rhachitis is generally found after chronic digestive disorders. The primary absence of phosphates is very rare, for there are few articles of food that do not contain a sufficient amount to build up tissues. Thus, for instance, there is proportionately very little rhachitis in New York City, though the drinking water is almost deprived of calcium. The very fact that there was almost no rhachitis twenty or thirty years ago, and that there has been an increasing number of cases within the last five or ten years, proves sufficiently that it is not the drinking water, but that it is the increase of poverty with its unfortunate results as to the impaired condition of the general health of the babies.

In reference to the significance of calcium in food, Foster has reached the following conclusions:

For eleven consecutive days he fed a baby on 1217 cubic centimeters of milk containing 136.8 cubic centimeters of solid substances. In the fæces he found 8.67 per cent. of solid substances. Thus all the solids in the foods had been absorbed with the exception of 6.35 per cent. (11 per cent. in the adult). The fæces of the baby had neither albumin nor sugar, but contained from 30 to 40 per cent. of fat and fat acids; further 34 per cent. of acids, one-third of which were joined to calcium, and a large amount of carbonic acid. Thus a large portion of the fæces consists of soaps, particularly the soap of calcium.

The mineral constituents were absorbed least, and next to them the fat and the ashes of milk in general; of these there were in the fæces 36.5 per cent.; of the calcium in particular 75 per cent. In spite of that the baby thrived and increased in weight, in one week 170 grammes. Thus there appears to be but little need of salts on the part of the growing baby. The baby receives in one day 1.25 grammes of calcium, of which there is an elimination of 0.92 grammes in the fæces and 0.03. in the urine of an infant two-and-a-half old. There is then a balance of 0.3 grammes in a day, of 2.1 in a week, of a kilo, or two pounds, of calcium in a year. This is all that is utilized.

Almost the entire quantity of calcium in the body is deposited in the bones, which contain 11 per cent.

of calcium in the adult, and in the infant and child somewhat less.

There are some very important practical points connected with the results of these observations.

As long as the food contains plenty of calcium and phosphoric acid, there is certainly no indication for the introduction of the same in the form of medicine or as an addition to food, for the purpose of improving nutrition. Thus the *combination of cod-liver oil with phosphate of lime*, which has become so fashionable, *is based on an illusion* concerning its alleged efficiency. Besides, the observation has been made also, at a very early time, that immediately after the administration of preparations of calcium, there was increased elimination through both the fæces and the urine.

Thus when there is no actual absence of calcium phosphate in the food, the organism should be spared useless exertion. In occasional cases when the effect appears to be favorable, this very effect is different from what was intended. When rachitical or anæmic infants are supplied with phosphate of lime, and iron, bismuth, etc., they are generally patients who are suffering from primary or secondary catarrh of the stomach with superabundance of acid in the secretion. In these very cases the calcium phosphate acts as an ant-acid, inasmuch as phosphoric acid becomes free and the lime neutralizes the acids of the digestive organs.

It has been stated that the fat acids saponify the alkalies found in the intestine. When there are enough alkalies to decompose the fat, but not a sufficient quantity to form soap, the result is the formation of free fat acids. When there is much free acid, all the alkalies of the intestinal fluids become neutralized, particularly the potassium and the sodium of the bile, which is indispensable for intestinal digestion because of its antifermentative effects. Not only is the effect of the bile present in the intestine destroyed in this way, but it also appears that, in consequence of that very fact, less new bile is secreted in the liver itself. For the absorption of food is required for the formation of bile, which cannot be formed in sufficient quantity when the food is but incompletely disintegrated and not absorbed.

A moderate amount of acid appears not to be abnormal. It is liable, however, to become abnormal with great facility. For normal fæces are always acid. There are always lactic acid, palmaric, stearic, caproic, and caprylic acids present in the intestine.

Hoppe-Seyler also found free fat acid in the fæces of dogs and adults. Wegscheider found the same in nurslings fed exclusively on mother's milk. For what I said with regard to the pancreas proves that its power to digest fat is but limited, at a very early age.

With regard to this, Wegscheider has made direct investigations which are formulated by him as follows:

Fat is not completely absorbed. Part of it leaves the intestine in the form of soap. Another portion is free fat acid. A third part remains unchanged.

There is a large amount of fæces, although the baby receives absolutely nothing but mother's milk. What has been called detritus in the fæces is not exclusively undigested caseine, but principally fat, and a large portion is the remnant of intestinal epithelium. This so-called detritus is not soluble in water, in acid or alkalies, but quite soluble in alcohol and ether.

Caseine is present only when it has been taken in too large quantities, or when there is too much free acid in the stomach. In these cases there may be large amounts in the fæces.

An important practical application of this fact is the following: As it is true that fat is not completely absorbed, even under the most normal circumstances; as free fat acids are easily formed and accumulated; as they are found in moderate quantities even in healthy babies; as we know that a surplus is very apt to derange digestion and assimilation and that it even prevents the normal secretion of either of the digestive fluids; as there is a superabundance of fat in the normal food of the nursling; the conclusion is that we should be very careful in preparing artificial foods. It is very easy to give too much fat; it is hardly probable thnt there is too little.

It has afforded me great satisfaction to learn that

O. Bollinger, in D. Z. f. Thiermed, 1880, p. 274, coincides with me in regard to the necessity of keeping the fat in infant food down to a certain percentage. He says: "Generally cow's milk, which contains large quantities of fat, from four to five per cent., is considered the best. Now, Foster found that when a baby four months old was fed on cow's milk with a decoction of rice, in the proportion of 4 to 1, albuminates and sugar were absent from the fæces; that is, they were completely digested. But the baby passed undigested from 30 to 40 per cent. of the fat, and 34 per cent. of mineral constituents.

This experiment proves, with the greatest probability, that such cow's milk as contains less fat, thereby resembling woman's milk, is preferable as a food for infants.

It is also not improbable that the good quality of milk in the country, which, as a rule, is well tolerated by children and adults, is based upon the fact that its percentage of fat is not very great, and that thereby it becomes more digestible. For Professor Feser has found that Alpine milk, which certainly is produced under most normal circumstances, contains very much less fat than the milk produced in the neighborhood of Munich. Inasmuch as the morning milk has much less fat than the evening milk, the former is preferable for the purpose of feeding infants."

SYMPTOMATOLOGY OF INTESTINAL DISEASES.

The symptomatology of intestinal disorders exhibits a few symptoms which many of them have in common. The most frequent of them are colic, constipation and diarrhœa.

COLIC.

Colic is a pain that has its seat largely in the walls of the intestine. It finds expression in the features of the infants. They cry loud, continually or paroxysmally, and move their lower extremities to and fro, up and down; now and then there are spastic contractions of other parts, as for instance the scrotum. In the highest degree of the affection, however, the children will keep their lower limbs quiet, every movement being painful. They are sometimes very pale, go off in convulsions, and appear collapsed. The attacks are intermittent, and frequently known to accompany digestive disorders. They are attended with flatulence which, when it inflates the bowels permanently, is called meteorismus or tympanites. Flatulency is more frequently found in connection with the cases attended with diarrhœa than with constipation. Not infrequently there is dyspnœa connected with it, which is the result of pain that compels the child to keep the diaphragm immovable. It has been said that when the seat of the difficulty is in the small intestine the abdomen appears pointed, and when in

the large intestine it appears generally enlarged, but I cannot say that I have noticed these marked differences.

The causes of colic are fermenting food, gastro-intestinal catarrh, the presence of a large number of ascarides, exposure to cold, cold feet, diminished tonicity of the muscular layer of the intestine, as in general anæmia and particularly in general rhachitis, and finally chronic peritonitis, which resulted in adhesions and anatomical changes in the intestinal tissue.

The symptomatic treatment, beside the occasional use of an antispasmodic or narcotic, consists in gentle massage, the application of dry heat, the administration of aromatic teas, freshly prepared, such as fennel, anise, German chamomile, catnip, *or* the injection of large quantities of such teas, quite warm, into the rectum. Care must be taken not to inject atmospheric air. Causal treatment is indicated by the intestinal disorders giving rise to the symptom.

CONSTIPATION.

The embryonic intestine is formed in separate divisions. There is no ascending colon up to the fourth or fifth month of fœtal life, and it is very short in the new-born. Despite this, the large intestine of the mature fœtus is longer in proportion than that of the adult, being three times as extended as the body, while it is only twice as long as the body in the adult.

There is the same disproportion with regard to the length of the small intestine, which in the foetus in the ninth month is twelve times as long as its body, while in the adult it is only eight times as long as the body.

The colon ascendens being very short, the surplus of length belongs to the descending colon, and especially to the sigmoid flexure. As the pelvis is very narrow, the great length of the lower part of the large intestine is the cause of multiple flexures, instead of the single sigmoid flexure of the adult, consequently, now and then, two or even three flexures are found, and to such an extent that one of them may extend as far as the right side of the pelvis. Cruveilhier and Sappey speak of this position of the lower part of the intestine in the right side of the pelvis as an anomaly. Huguier finds it on the right side of the body in the majority of cases. Others only occasionally, although they admit the great length of the sigmoid flexure. In common with Huguier, who even proposes to operate for artificial anus in the right side, I have found one of the flexures on the right side many times.

This great length of the large intestine and the multiplicity of its flexures, are of great functional importance; at all events, they retard the movement of the intestinal contents, and facilitate the absorption of fluids, and thus the fæces are rendered solid. When this length is developed to an unusual extent, con-

stipation is the natural result. In the American Journzl of Obstetrics, August, 1869, I have described two cases in which the descending colon was so long that the diagnosis of imperforate rectum was made. In one of them the operation for artificial anus was performed. Such cases and such errors are certainly very rare, still they are those, in which normal anatomical conditions will lead to incidents of great pathological importance.

Other causes of constipation in the infant may be:

First.—The intestinal mucus is deficient or too viscid, as is true in febrile conditions, now and then in chronic intestinal catarrh, and also when there is too much perspiration and secretion of urine.

Second.—Improper condition of food; a superabundance of caseine, particularly cow's caseine, of starch, the absence of sugar, and the administration of astringents and iron.

Third.—Incomplete peristalsis, such as exists in the rhachitic debility of the muscular layer, in the muscular debility dependent upon sedentary habits, in peritonitis, intestinal atrophy and hydrocephalus.

Fourth.—Mechanical obstruction. Cystic tumors in the intestine will be treated of elsewhere; there is, further, intussusception and twisting of the intestine, incarcerated hernia, even umbilical hernia, hardened fæces, imperforations.

In all these cases the diagnosis should not be made without manual examination. In most of the cases

the abdomen is inflated even though it be painless, and the fæces come away in small hard lumps or in large masses. The liver and spleen are displaced, and the former may be so turned that a part of its posterior surface turns forward. The abdominal veins are enlarged to such an extent that they form circles around the umbilicus, similar to what is seen in hepatic cirrhosis. Such children lose appetite, sometimes vomit, and the irritation produced by the hardened masses in the intestinal canal may be such as finally to result in diarrhœa, which, however, is not always sufficient to empty the tract.

There is, besides, an *apparent* constipation, which should not be mistaken for any of the above varieties. Now and then, a child will appear to be constipated, have a movement every two or three days, and at the same time the amount of fæces discharged is very small. This apparent constipation is seen in very young infants rather than in those of more advanced age, and such are emaciated, sometimes atrophic. They appear to be constipated because of lack of food, and not infrequently this apparent constipation is soon relieved by a sufficient amount of nourishment.

Constipation resulting from a superabundance of starch in the food is easily cured by the withdrawal of the latter. Infants that have been fed on starchy food or even such cereals as barley, should have oatmeal substituted.

Constipation produced by too much casein in the

food will be relieved by diminishing its quantity. The proportion of casein in the food of infants, as before remarked, should never be more than one per cent.; besides this amount of casein ought to be copiously mixed with a glutinous decoction. Oatmeal is preferable to barley.

Constipation depending on lack of sugar is very often speedily relieved by increasing the quantity in the food; this is the case, not only in artificial feeding, but also when fed normally on breast-milk. Such mother's milk as is white and dense, and contains a large amount of caseine, is made more digestible, and will produce better evacuations, when a piece of loaf sugar dissolved in tepid water is given immediately before nursing.

Very little medicine should be given in all these forms of constipation. The best, after all, may be magnesia, as there is frequently too much acid in the intestinal tract of the young, which it will neutralize and at the same time relieve the bowels. Whenever an addition is necessary, rhubarb will suffice. In most cases an enema will be sufficient to relieve, and should be given every day for a long time, the prejudice against rectal injections being unfounded. They should not, however, be given too hot or too cold, and may contain a small quantity of salt so as to make a two-thirds of one per cent. solution. In those cases where constipation is very obstinate, the enema should be given through a tube from four to six to eight

inches in length; beyond that it is usually impossible to introduce a tube. In very serious cases, particularly in those which depend upon an unusual length of the sigmoid flexure, it is sometimes necessary to remove the hardened fæces by means of the finger or a spoon.

Massage has already been mentioned among the remedies. Electricity also has been successfully used when constipation was the result of insufficient peristalsis; but lately, E. Schillbach found that the several portions of the intestinal tract respond differently to the application of the Faradic and Galvanic currents. In general, moderate Galvanic currents have a stronger effect than moderate Faradic ones. Local contractions result from the negative pole ("Kathode"), peristaltic waves from the positive ("Anode"), thus for the relief of obstinate constipation the former should be applied in the rectum, and the latter over the abdomen, along the colon.

PREDISPOSITION TO DIARRHŒA.

Healthy infants have a normal tendency to loose, liquid or semi-liquid evacuations from the bowels. The cause of this looseness of the bowels lies partly in the condition of the intestinal tract, and partly in the nature of the normal food which is breast milk. Peristaltic movements in the healthy child are very active. The young blood and lymphatic vessels are very permeable, and the transformation of the sur-

face cells is very rapid. The peripherous nerves are very superficial, more so than in the adult, whose mucous membrane and sub-mucous tissue have undergone thickening by both normal development and morbid processes. In the young infant the peripherous ends of the nerves are longer in proportion, than in the adult. The anterior horns in the nerve centres are more developed than the posterior ones. Moreover, through the defective development of the inhibitory centres, the greater reflex irritability of the young, particularly with regard to intestinal influences, is easily explained. Besides, the action of the sphincter ani is not very powerful; the fæces are not retained in the colon and rectum, and but little time is generally afforded for the reabsorption of the liquid or dissolved intestinal contents.

Moreover, the frequency of acids, sometimes normal, in the small intestine, gives rise to the formation of alkaline salts with purgative properties. Hoppe-Seyler found free acids in the fæces in dogs and the human adult. Wegschneider met them in nurslings who received nothing but mother's milk. An explanation of this occurrence may be found in the fact that the quantity of food is often too large; but in many instances the amount of digestive fluid is too small, and thus gives rise to a fermentative process in place of normal digestion. Moreover, the diastatic effect of the pancreatic juice is limited at a very early age, and undigested material is carried off.

FAT DIARRHŒA.

Under the head of fat diarrhœa German journals, and a few text-books, speak of a flux, the chief characteristic of which is the presence of a large quantity of fat in the stools. The normal fæces of the newly-born contain ten or twelve per cent., sometimes more, of fat; in abnormal cases even when the food does not contain a surplus, the fæces may exhibit from 40 to 70 per cent. of fat, which in these cases is not saponified, but free.

The anatomical condition of the intestinal tract may vary in fat diarrhœa, but, in the majority of cases, we have to deal with a simple catarrh; the microscope reveals in serious cases, fat almost to the exclusion of everything else, sometimes pure, sometimes in needle-like bodies. The causes are, changes in, and exfoliation of, the epithelium of the small intestine; swelling of the mucous membrane of the duodenum, resulting in an obstruction to the flow of bile and pancreatic juice; and hyperplasia of the mesenteric glands by which the chyle circulation is impeded to such an extent that the chyle vessels are empty. All these conditions are, or may be, the result of intense catarrh with its consequences. Finally, in a very few instances, anatomical changes in the pancreas have been well known to interfere with the emulsion of fat.

Any improvement of the condition is impossible unless the quantity of fat contained in the food be

largely diminished; the indications for causal treatment are given by the condition of the intestine and pancreas.

ACUTE INTESTINAL CATARRH.

Gastric catarrh may descend, and catarrh of the rectum or colon may ascend, but catarrh will also originate in the small intestine, sometimes in the duodenum, the jejunum, or the ileum. The causes are, food given in improper quantity or quality—improper artificial food mostly, though even mother's milk may cause it. Mothers who are sick, or convalescing, or the subjects of very strong emotions, who nurse too often, who suffer from tuberculosis or syphilis, who are pregnant, who are menstruating, or who are anæmic, secrete improper milk. The colostrum secreted immediately after child-birth is apt to give rise to diarrhœa, and milk containing too much fat, or too many salts (as is the case in anæmia), is liable to produce the same effect. Infantile age, moreover, is very sensitive, more so than advanced age, to the heat of the summer, to the influence of the diminution or increase of atmospheric moisture, and to the settling of ground water. Besides, the mucous membrane with its lymph vessels is more irritated by the results of fermentation, such as phenol, indol, skatol, bacteria and bacilli.

Further causes are the direct influence of purgatives, or those medicines, like arsenic or corrosive sublimate, which are not tolerated either on account of

idiosyncrasy or improper doses. Other causes are infectious influences, such as exposure to cold, typhoid fever, dysentery, and severe forms of malaria. Finally, disturbances of circulation, of the liver, lungs, and heart, which predispose to passive hyperæmia of the intestines.

Autopsies are not very frequent, except in the bad cases complicated with acute gastric catarrh, and described as gastro-intestinal catarrh, or "cholera infantum," mostly during the summer. The local changes in the mucous membrane may be superficial or deeper; it is injected and of a pink color, covered with mucus, often thickened, and its vessels very distinct; the epithelium is often absent, though this change is frequently cadaveric. The glands are more prominent, and contain a large number of recently proliferated cells; the follicles of Lieberkühn in the colon and rectum are filled with mucus, or are ulcerated, and some of them may be the seat of cystic degeneration; Peyer's patches are also filled with mucus and enlarged. In some parts of the mucous membrane the erosions are pale and form what has been called catarrhal ulcerations. The connective tissue being hyperplastic, now and then gives rise to polypoid excrescences. The mucous membrane, however, may, in protracted cases, undergo atrophy, particularly in the neighborhood of the glands which may disappear entirely; the muscular layer, also, may undergo atrophy, particularly in the colon and ileum.

Symptoms.—There is fever, diarrhœa and pain, and when the affection begins in the stomach, vomiting also. The babes are pale, and draw up their lower extremities, and when the catarrh descends to, or begins in, the rectum, there is tenesmus. The evacuations in the beginning contain remnants of food, and have a stronger odor than normal fæces; afterwards are liquid, light yellowish or brownish in color, strongly acid, but later of an alkaline reaction, with many specimens of bacteria (none of which are characteristic of the affection), epithelium, mucus, sometimes pus, and remnants of food of all kinds; the percentage of water is very large, amounting to 90 to 95 per cent., while in normal fæces of the nursling it is but 85 per cent., and, in older children, 80 to 75 per cent.; particularly is the percentage of water large in all those cases of diarrhœa which depend upon, or are complicated with, disturbances of the circulation. The odorless condition of the evacuations changes very soon, when they become fæcal, afterwards acid, and in protracted cases and so-called follicular enteritis, cadaveric.

In the beginning of the disease there is sometimes herpes labialis, and the urine is diminished in quantity, but is entirely arrested only in the very worst cases of choleraic diarrhœa. In a few cases recovery is quite rapid; in others the disease terminates in so-called follicular enteritis, or in chronic intestinal catarrh.

Complications may be various. Not infrequently is there bronchial catarrh, broncho-pneumonia, and peritonitis—the latter being much more common than is generally supposed; and many of the “belly-aches” of grown up children are new attacks, more or less severe, of peritonitis dating from the diarrhœas of early infancy and childhood. One of the frequent results of gastro-intestinal catarrh, either acute or chronic in very young infants, is general peritonitis.

When there is diarrhœa we have to conclude that, in most cases, the upper part, at least, of the colon is affected. Food remnants will require two or three hours to pass from the pylorus to the cœcum, and at that time it is always liquid—a character foreign to normal conditions; thus, when quite fluid, an affection of the upper part of the colon necessarily exists and results in undue peristalsis.

Duodenal catarrh can be diagnosed only when it is complicated with jaundice, as it never gives rise to diarrhœa. That of the jejunum and ileum is seldom isolated without the upper part of the colon participating in the process, and it must be supposed that they are included when the stomach is affected. When the fæces are fairly solid and contain conglomerate masses of mucus thoroughly mixed with the fæcal masses, we make the diagnosis of isolated catarrh of the small intestine. Further, when the fæces contain a great deal of undigested material we may also conclude that we have to deal with a compli-

cated catarrh, involving both the small intestine and stomach; this is the condition in which undigested food is seen in the fæces and called *lientery*. But it must be remembered that gastric catarrh alone, with anæmia and abnormal peristalsis of the stomach and upper part of the small intestine, is of itself able to propel undigested food with abnormal rapidity.

When there is bile in passages of green color, yielding a distinct reaction with nitric acid, and attached to the mucus and cylindrical epithelium and round cells, we have also to conclude that the catarrh has its seat in the small intestine, as under normal conditions there is but very little or no bile in the large intestine.

It has been stated, that when there is considerable peristalsis and rumbling (audible, or perceptible by palpation), in the middle of the abdomen and its lower part, the affection is in the small intestine; that it is lateral and in the upper part, when the large intestine is involved. Still, neither pain nor locality is absolutely pathognomonic. There is one condition, however, that is, viz.: When the mucus is not thoroughly mixed with the fæces, when the fæces are wrapped up in, or covered by it after evacuation, that mucous comes from the colon, and we have to deal with a catarrh of this intestine; and when the fæces are still solid, the catarrh may have its location in the lower part of the colon.

As a general rule, acute catarrh of the lower part

of the colon generally furnishes pure mucus mixed with blood, particularly in the catarrhal form of dysentery. When the secretion from the colon is very considerable, the passages are evacuated more or less frequently, in large quantities or smaller ones, suddenly and with a gush, and usually without tenesmus, which is observed only when the lower portion of the rectum is involved in the morbid process.

Thus, common catarrh of the colon must not be mistaken for the other form called membranous enteritis.

The *prognosis* of acute intestinal catarrh is favorable to babes at the breast or those fed upon artificial food well selected, when they are not too young or feeble, and the necessary intelligent care is bestowed upon them. It is unfavorable when the infants are very young; when they are bottle-fed, and their food is poorly selected; when their nutrition and care has always been bad; when they are rhachitic; when they have had some disease previously; also in large cities in the summer. Complication with peritonitis is very unfavorable when the latter is acute; and complication with chronic peritonitis threatens relapses.

Internal Medication.—Empty the stomach and bowels of fermenting masses. The castor oil of the lay public answers well. A dose of calomel (grs. j-vj) answers better, because it acts as an anti-fermentative, besides being a purgative.

Neutralize acids (fat acids) in the stomach. Car-

bonate or phosphate of calcium, grs. j-ij, every one or two hours, acts as an adjuvant to other treatment. Bismuth also answers this indication, besides being an anti-fermentative. Dose, grs. ss-ij every one to two hours. May be combined with opium. Dover's power, grs. $\frac{1}{10}$ $\frac{1}{2}$ $\frac{1}{3}$, every one, two to four hours, when the odor has improved. No salts of magnesium or sodium, because they add to the diarrhœa in these acute cases. Avoid syrups to correct the taste of medicines. They will turn sour. Prefer glycerin.

*Anti-fermentatives.**—Calomel, bismuth, alcohol, creasote, salicylate of sodium, and resorcin have been recommended for their anti-fermentative effect. Of the two latter I prefer resorcin, iv-x grains a day, in

* The practice of giving anti-fermentatives has preceded its theory for centuries. Still the theory is not quite so recent as a few modern journals appear to believe. In "Treatment of Infant Diarrhœa and Dysentery," by A. Jacobi, M. D., in American Journal of Obstetrics, etc., July, 1870, there are the following remarks:

"A further indication is to destroy ferments. For that purpose most metallic preparations will do fair service. One of those is calomel * * * as to its effect an anti-fermentative there can be no doubt. * * * Possibly, it acts by a portion of the drug being changed slowly into the bichloride of mercury."

"Alcohol certainly arrests fermentation."

"Sometimes, particularly when the stomach can be relied on, the salicylate of sodium may be added to the internal treatment. * * * The salicylic acid may prove beneficial, both by its antifebrile and disinfectant action."

solutions (suspensions), or as a constituent of powders (with bismuth, chalk, opium).

Sedatives.—Opium depresses hyperæsthesia, hyperperistalsis, and hypersecretion. Dover's powder (gr. $\frac{1}{10}$ to $\frac{1}{3}$ every two to three hours) acts very well, though some writers object to it, and is indispensable when the odor begins to be normal. Does well with bismuth, and prepared chalk, with or without resorcin.

Astringents.—In acute cases, and when the stomach participates in the process, lead, tannin, gallic acid, alum, etc., are badly borne. In chronic protracted cases they will find their indication. Nitrate of silver does better in many cases, gr. $\frac{1}{80}$ th to $\frac{1}{30}$ th in 2 drachms of distilled water (dark bottle) every two hours. Creasote water in chronic cases, $\frac{1}{4}$ to $\frac{1}{2}$ teaspoonful several times daily.

Stimulants.—Alcohol may be mixed to food. Bad brandy or whiskey contains fusel oil, which is a paralyzing agent. Whiskey is therefore preferable with us, because it can be obtained in greater purity for less money. (See under "Food.") Never give it raw. Camphor is better borne than ammonia. It is easily taken when simply rubbed off with glycerin, suspended in mucilage (gr. $\frac{1}{4}$ -ij every one to two hours). The strongest nerve stimulant of all is *Siberian* musk. Give in *urgent* cases of collapse gr. i-ij every fifteen or thirty minutes (best suspended in mucilage) until six or twelve grains have been taken. A very good stimulant in collapse is the injection into

the bowels through a long flexible tube (catheter No. 12) of hot water with some alcohol, and one or a few drops of tinct. opium while the hips are raised.

EXTERNAL APPLICATIONS AND HYGIENE.—In acute cases with high temperature, applications of water of 60°–70° to abdomen. Where much pain and with anæmic children, warm applications do better. Frequent injections of water of 100° F. answer well in most cases, not only in rectal catarrh. In collapse or great debility, the water ought to be from 105° to 112° F., and contain some alcohol and opium. Part of this water will be absorbed, fill the blood-vessels, and may prevent intracranial and other thromboses. The addition of gum arabic to the injection, or the use of glutinous decoctions (flax seed) instead of water is quite satisfactory. Open doors and windows in hot weather. Select the coolest place in the neighborhood for the patient, day and night. Night air is better than no air. Country air, sea air, better than city air, particularly at some altitude. When the body is warm and the weather hot, wash the body with cool water, or alcohol and water (1:5) frequently. Cold feet must be warmed artificially.

Food.—*No raw milk, no boiled milk, no milk admixture at all in bad cases.* In vomiting and severe diarrhœa, *total abstinence* for from one to six hours. Afterward teaspoon doses of a mucilaginous or farinaceous decoction. Regular food: 5 ounces of barley-water, 1 2 drachms of brandy or whiskey, the white

of 1 egg, salt and sugar, teaspoonful every five or fifteen minutes, according to age and case; this may be mixed with mutton-broth, which, with white of egg, etc., is better than beef soup or beef tea in convalescence. Abstinence better for vomiting than ice; the latter may quiet the stomach, feel pleasant, but stimulates peristalsis. Avoid beef tea. If it be given in convalescence, mix with barley-water.

Toward the end of the disease, or when the discharges are many and copious, with inspissation of blood and thromboses (hydro-encephaloid) threatening, the common sense of the practitioner will introduce liquid into the circulation as best he can. No written rule ever supplies or substitutes brains.— (*Medical News*, July 9, 1887).

CHRONIC INTESTINAL CATARRH.

The causes of this disease are essentially the same as those of the acute form. It occurs mostly in nurslings in which both the anatomical structure and the physiological functions of the intestinal tract are still imperfect, and is liable to establish itself when the alimentary disturbances have not been very severe, but rather of a light character, and frequently repeated.

Artificial food, improperly selected and prepared, which is not digested and absorbed, undergoes fermentation and irritates the mucus membrane. When the effect is slow and persistent, the final changes are atrophy, that is, emaciation of the whole body.

The mucus membrane of the intestinal tract is rather pale, loose, and its folds large. The sub-mucus tissue is full of new cell proliferations (as are also the solitary glands and Peyer's patches) which are pale and prominent, sometimes to a great extent, and some may be ulcerated. The visceral lymph bodies are very large, hard, white on section, and finally undergo atrophy; the liver is large and fatty. If vascular hyperæmia have been present during life, it is not very perceptible after death. Not infrequently there are complications with tuberculosis in other organs, and cerebral thromboses. The surface of the brain is intensely congested, and the pia mater œdematous. The whole body is frequently rhachitic, and emaciation may be so marked that nothing but skeleton and skin appear to be left.

There are from five to ten liquid stools, alkaline, or acid, daily, that are fæculent or of bad odor, greenish, mixed with white flocculi and caseine or fat, and contain bacteria and zoöglœa, remnants of food, epithelial mucus in the well-known shape of sago, sometimes blood, some albumin, and cholesterine; the ashes amount to about 20 or 25 per cent. When the diarrhœa is alkaline, it contains mostly the phosphate of ammonium and magnesium; when acid, fat acids.

There are a great many attacks of colic; the abdomen is distended and tense or soft, sometimes depressed and flat; the liver very perceptible to touch,

as in many cases is the spleen. The little patient is apathetic, thin and flaccid; the skin folded, and pale; ribs very perceptible; tongue furred and red along the borders. After a while the face appears senile, and the fontanelles depressed; the pulse becomes small and frequent, the mouth dry and red, the voice hoarse, the eyes large and staring, the surface cool and œdematous, sometimes exhibiting the hardness of sclerema.

When the diarrhœa has its origin in the small intestine mostly, it appears to be more copious, and there is more rumbling of gas. When the colon is chiefly or equally affected, the stools are less copious but more frequent, expelled with a gush, and sometimes with marked tenesmus. Death is apt to result from general exhaustion—the pulse getting smaller and gradually disappearing—or from complications with respiratory diseases or convulsions, Marshall Hall's "hydrencephaloid disease."

Prognosis.—Some fully developed cases, even though the skin be so poorly nourished as to produce intertrigo, acne, furuncles and general erythema, and the tongue so impaired as to exhibit fissures, after all recover; but the prognosis in far advanced cases is generally bad.

Treatment has been forestalled under the head of acute catarrh, proper nutrition and the selection of proper remedies being equally important; a number of very young infants will get well only when a wet-

nurse has been substituted for any artificial food. Astringents are more frequently indicated here than in acute catarrh, but the general indications are the same. Chronic catarrh of the large intestine requires local treatment, as before indicated; the cases in which finally diarrhœa and constipation alternate with each other, do well under the influence of Carlsbad waters, half a wineglassful, or less, three times a day.

FOLLICULAR ENTERITIS.

It has been stated that in all catarrhal conditions of the small and large intestines, the follicles participate in the process; this is particularly so in chronic cases. Follicular enteritis is simply an aggravation of a common catarrh (originating in the ordinary causes acting in the summer season) in early infancy, but less so in the cooler part of the season and in older children, and is a peculiar form seen not infrequently when the system has been impaired by infectious diseases such as measles and scarlatina.

The pathological changes are those of catarrh, but the most severe alterations take place in the solitary follicles and Peyer's patches. Both of these are enlarged and prominent, and grayish or grayish-red, the latter surrounded by a red zone; now and then ulcerations are found. The microscope also reveals a large number of newly-formed round cells, disintegrated or not. In the ulcerations there are large

masses of detritus and bacteria. The lymph vessels and lymph bodies participate in every severe form of intestinal catarrh, and particularly there is a large amount of acute and chronic tumefaction of the mesenteric glands.

The symptoms vary according as to whether this particular form is connected with acute or chronic intestinal catarrh. In the first variety there is fever, diarrhoea, frequent and copious discharges, all accompanied by pain; the inclination to evacuate the bowels is constant, and there is some tenesmus. When the latter is present, the passages are small, greenish, foamy, have an insipid, musty, and after a while, cadaveric odor, are covered with mucus, some blood and pus; real hemorrhage is rare. Under the microscope are seen mucus, blood, pus, and round cells, unchanged or undergoing disintegration, and bacilli, and bacteric zoöglæa.

The symptoms are liable to increase very rapidly, and complication with pulmonary diseases and peritonitis are not infrequent. Although the disease is a very serious one, slow recovery may take place.

When the disease originates in chronic intestinal catarrh, it generally runs its course without fever, or with occasional exacerbations of temperature. The diarrhoea is of the same character, and contains much pus. There is not so rapid an emaciation in the chronic as in the acute form, still, emaciation gradually increases and becomes well-marked; the skin loses its

elasticity, and can be easily raised up in folds, and does not for a long time return to its normal position.

The diagnosis of follicular enteritis is made from the pain, the speedy development of bad symptoms, the early emaciation, and the condition of the passages. It must not be forgotten, however, that there is more or less participation on the part of the follicles in every case of intestinal catarrh, and it is a matter of *doubtful convenience* to speak of follicular enteritis as a special form.

This severe form, a generalized catarrhal enteritis, is more apt to terminate fatally than the common variety. The prognosis is worse when there has been diarrhœa before; when the children are rachitic, anæmic, or have suffered from other diseases; when they are very young; when the fever is high; when there are complications with bronchitis, pneumonia, or peritonitis. Some of the children are spared a long time, and finally succumb to intestinal ulceration. The treatment consists of meeting the same indications as in acute and chronic catarrhal enteritis in general, but it is less promising because the anatomico-pathological lesions are more severe.

MEMBRANOUS ENTERITIS.

Cases of this affection are not very frequent even in the adult. There are many authors who do not mention it, though Vidal, Wilks and Clark, Perroud,

Beale, Da Costa, Goodhart (and some of the text books, mainly Pepper's *Cyclopædia*) discuss it; a very good exposition of the subject is found in the *Medical and Surgical History of the War of the Rebellion*, Vol. II, p. 1, 1879. The morbid specimen forming the main symptom of the disease is a dense membrane, of several inches, in rare instances a foot long, flat, or often cylindrical, exhibiting a cast of the whole intestine. It is sometimes tenacious and viscid, mostly quite firm, so that a cylinder many inches in extent may be raised on one end without tearing off. It consists mainly of mucus of a very dense and hard nature, with very little serum, some little fibrin, a hyaline granular matrix, some white blood cells, and columnar epithelium; thus it cannot be mistaken for a general diphtheritic enteritis which now and then is met with in the small intestine, but more frequently in the colon. The latter, mainly in its lower part, forms the more serious and dangerous form of the dysenteric process. In membranous enteritis the mucous element prevails over all others; still, there are cases in which this muco-membranous form is mixed with, or transformed into the later fibrino-membranous form; it is well-known that a sore mucous membrane, or a chronic catarrh, yields an opportunity for diphtheritic deposits. Most of the children and adults—it is chiefly observed in women—who suffer from membranous enteritis, are neurotic.

DIPHTHERITIC AND CROUPOUS ENTERITIS.

It is rare, and occurs mostly in the lower portion of the small intestine. It is sometimes connected with general diphtheria, sometimes it ushers in an attack of it. It is more frequently connected with ulcerous catarrh. In these cases the exudation is deposited upon the mucous membrane rather than imbedded in it. The mucous membrane is red and thickened. The affection does not extend over a large surface. It is seen most frequently in the colon.

Even in such cases in which the diagnosis can be made with some degree of probability, the medicinal treatment yields but unsatisfactory results. Most antiseptics introduced into the stomach do not reach the seat of disease. Animal charcoal, bismuth, naphthalin, and salol are amongst those which are most promising. Enemata must be tried, and may reach the diphtheritic surface in some instances.

ULCERATION OF THE INTESTINES.

There are chronic catarrhs of the intestinal mucous membranes in which the cellular infiltration is so copious as to result in actual *suppuration*, when the tissues undergo multiple local mortification ending in ulceration of the surface; in rare cases these abscesses and ulcerations are submucous and fistulous. When this process is very extensive, it *looks very much like a diphtheritic affection*, inasmuch as the surface, particularly the elevations of the mucous membrane, appear gray and membranous; and when the scabs are thrown off, ulcerations remain behind. During all this time when an exudation of cells, serum, and fibrin has been deposited, the resemblance to diphtheria is very strong indeed, and the mistake in diagnosis is the more easily made, since genuine diphtheria is found in the small intestine, though in exceptional cases only; but, as a rule, diphtheritic processes, as stated before, are found in the lowest part of the small intestine, and in the colon and rectum, and then go by the general name dysentery.

The lymphadenoid tissue of the intestine, that is, the solitary follicles and Peyer's patches, participate in many of the morbid processes of the bowels. When the inflammation invades the follicles by preference,

the process is called, as before stated, follicular enteritis. The lymph bodies swell considerably by proliferation of cells, and through accumulation and pressure upon each other, disintegration begins in the centre of those which are enlarged, and ulcers are formed of a hollow, or scooped-out, appearance.

Dysenteric ulcerations are quite frequent both in acute and chronic forms. Either are dangerous, both in themselves and by their possible consequences, as for instance, abscess of the liver. The *catarrhal* and *diphtheritic* forms cannot always be distinguished from each other, and are often found together. The ulcerations may be superficial, deep, or undermined, the loss of substance small or large, and usually the lymphadenoid bodies participate.

Typhoid ulcerations, when the disease is less mild than usual, have their seat, as a rule, in the lower part of the small intestine, about the cœcum, and in the upper part of the large intestine; sometimes higher up in the small, very frequently lower down in the large. In some epidemics relapses are very frequent when the colon transversum, descendens, and even the rectum, are invaded; thus we may find the different stages of ulceration in the different parts of the intestine at the same time; cicatrization in the earlier ones of the cœcum, scooped-out ulcers in the transverse colon, recent cellular infiltration in the descending colon and rectum.

Around these ulcerations there is a considerable

amount of hyperæmia. As a rule, they are confined to the patches of Peyer and the solitary follicles, and their immediate neighborhood, but the surrounding mucous membrane is often invaded, and the defects of substance become very large, particularly about the cœcum. Usually the mucous and submucous tissues are the only ones which undergo destruction, but the muscular and serous layers will also ulcerate, and perforation may ensue. It is worth while to remember that there may be *ulceration and perforation without any diarrhœa*.

Such was the case in a girl of eleven years, a patient in ward 28, in Bellevue Hospital. She was under observation for more than two weeks. During all this time she had no loose passages; on the contrary, now and then she had marked constipation, which required injections. She died suddenly of acute general peritonitis. Such peritonitis is the result of perforation, as a rule, though there may be local peritonitis without it, in which case we find grayish-white discoloration and thickening of the serous membrane opposite the ulceration—a dangerous condition, for two reasons: It may give rise to sudden perforation during entire health apparently, months and years after typhoid fever, and also to repeated attacks of peritonitis which later on may prove fatal. I have now under observation a boy of twelve, who suffered from severe typhoid fever last October and November, and apparently entirely recovered,

but never regained full strength. His appetite was whimsical, and the voracity peculiar to those who have gone through typhoid fever never manifested itself. He complains, sometimes every day, sometimes every week, of severe pain in the right side of the abdomen, occasionally extending all over the abdomen, increasing on pressure, now and then attended with elevation of temperature, complicated with constipation, and relieved by absolute rest in bed and the use of warm applications. Meanwhile he is pale, haggard, and the subject of chronic peritonitis with adhesions.

Nor is peritonitis infrequent after protracted diarrhoea. Many years ago I presented to the New York Pathological Society a specimen of intussusception of the bowels, which reached all the way down from the transverse colon into the rectum, so as to be easily accessible to the finger. It proved to be irreducible, and at an autopsy it was found that the serous membrane of the enveloping part had been torn in half a dozen different places. The rents in some places reached down to the muscular layer. These rents or partial perforations of the serous membrane and muscular layer were evidently due to changes in the serous coat which showed white discolorations, rather stiff and hard deposits in the tissue, and were evidently the result of chronic peritonitis from which the patient had suffered a long time ago.

In the beginning of the disease, it was stated

that the boy had always been healthy, but when questioned afterwards it was found that, in two summers, the child had suffered from protracted and severe diarrhœa, in which the intestinal catarrh had evidently not only affected the mucous membrane, but had penetrated the muscular layer, and thickened and changed the structure of the serous membrane.

Intestinal ulceration is by no means rare in children suffering from typhoid fever, which with us assumes an undefined character, is quite often diagnosed only by exclusion, exhibits little or no diarrhœa, and sometimes little roseola or splenic enlargement; what it lacks in intensity, however, is made up in duration—it has quite frequently few and mild symptoms, but a protracted course. Many a “chronic diarrhœa,” or marasmus, or “consumption of the bowels,” dates from typhoid fever, and proves again and again that the slightest morbid symptom, having a definite cause, requires its definite diagnosis, and demands relief and removal; and every diarrhœa has its cause, which must be considered removable. I am positive that I see every year half a dozen cases of chronic diarrhœa which can be traced back to typhoid fever.

Tubercular ulcers are mainly found among adults, and exhibit less tendency to heal than any other form of ulceration; the infiltration of the lymphadenoid bodies, mainly between the cœcum and rectum, develop into either circular or irregular ulcers, which are

apt-to increase until fatal termination results. In children they are not frequent, but do sometimes occur. Perhaps the most extensive ulcerative process set up in the shortest time, is by *septic* enteritis brought about by swallowing putrid material in large quantities. I have never seen them so bad as I met them in the victims of a summer hotel at Lake Mahopac, more than a dozen years ago, where the boarders had to drink their own diluted fæces.

Of a similar, though milder, nature, are all those ulcerative processes which are the result of *protracted previous constipation*. Many causes will here combine to produce ulcers, namely: pressure of hardened fæces with accompanying chronic hyperæmia, and the presence of septic gases which can not yet be expelled because of the semi-paralyzed condition of the intestinal tract, and of the physiological interruption of peristalsis at the cœcum, and are then absorbed. Elsewhere I have shown one of the causes of serious constipation in the very young to be due to an extraordinary length of the sigmoid flexure.

In one such case I have seen, when the child was three or four years old, intense chronic and fetid diarrhœa following the constipation of a life time. In that case I felt that the persistent locking up of the intestine was the cause of ulceration. The regular daily administration of an enema would have prevented the sad termination of a condition which became pathological, from an excess of normal physiological development—by neglect.

Syphilitic ulcerations are rare in the small intestines and colon, but they, and nodular conglomerates which had not yet undergone disintegration, have been met with. Intestinal syphilis is mostly hereditary and found in newly-born infants; there are gummata in the patches or near them, which change into ulcerations, and sometimes cover the whole mucous membrane circularly.

Foreign bodies are apt to give rise to ulcerations. I have seen them in the duodenum in consequence of pressure by big gall-stones (in the adult only), in the colon by the presence of hard fæces in the rectum, and about the sphincter by prune stones, glass-pearls, and coins; and one deep traumatic ulceration was from a stick three inches in length, such as are used by the butchers to hold roasts together, which had been swallowed by the "lady." Before a section of the New York Academy of Medicine I presented, a few months ago, about one-fourth of the material contained in the intestine of an infant suffering from chronic diarrhœa in the service of Dr. B. Scharlau, Mount Sinai Hospital. It consisted of about an ounce of worsted yarn, such as is used for the knitting of coarse stockings. *Entero-liths* I have seen a few times, resulting in ulcerations, in adults, but a single time only in a child of five or six years.

Treatment.—In acute cases of dysentery, great sensibility and heat of the left hypogastric region will be alleviated by the application of ice. Very young

infants, however, bear ice but a short time, whether applied to head or abdomen, and I advise to watch the effect of the application either of the ice bladder or the ice-cold cloth. Now and then, even in adults, we meet with idiosyncratic incompatibility with cold; that has to be taken into account. Sometimes warm applications of either water or poultices, prove more efficient in regard to the two indications, which consist in alleviating irritation and reducing temperature; and sometimes a simple warm application, which may be changed every few hours, or a cold application which is permitted to get warm on the skin, will result in reducing both pain and temperature

Bismuth, subnitrate or subcarbonate, not only covers and protects the mucous membrane, but has also a decided anti-fermentative effect, and is surely indicated in irritated conditions; it seldom fails when given in sufficient doses—such doses that part will pass through the entire length of the intestinal tract without undergoing decomposition. As its taste is not disagreeable, it may be given with tannin and opium; the daily dose ought not to be less than one drachm or a drachm and a half (4.0 to 6.0); at the same time the passages ought to be examined as to their reaction. Abundant acid, so frequently found in the slightest intestinal anomalies, requires the additional administration of alkalies, preferably carbonate of lime rather than either magnesia or bicarbonate of soda, which are apt to increase diarrhœa. Sometimes, particu-

larly when the stomach can be relied upon, the salicylate of sodium may be added to the internal treatment; beside the favorable effect of the sodium in the intestinal tract, the salicylic acid may prove beneficial both by its anti-febrile and disinfectant action. Opium and its alkaloids are invaluable, the objections thereto being decidedly exaggerated; the accidents reported resulting from its administration, must be attributed to a dose absolutely or relatively too large compared with the idiosyncrasy of the patient. Dysentery requires and tolerates larger doses of opium than an average diarrhœa, no matter whether the latter be the result of catarrh or ulceration of the small intestine or cœcum, or of the upper part of the colon; in this respect dysentery stands abreast almost with peritonitis. The main indications are to relieve pain, reduce peristalsis, and diminish the copious serous secretion, and no other remedy fulfils all of them so well as opium; and it should be given internally, for while opiate enemata may act favorably, the more intense the tenesmus, the greater the hyperæmia, or the more extensive the ulceration, the less reliance can be placed on its effect, and the amount of the drug thus brought into real action cannot be estimated. I prefer the tincture, the wine, opium in substance, or Dover's powder, rarely employing morphia especially hypodermically. The effect is easily watched and controlled by commencing with moderate doses, not repeated too often, and by being guided by the effect

obtained. If opium is to be discarded, hyoscyamus with belladonna, or hyoscyamus alone may be substituted temporarily. Severe tenesmus may require the painting of the protruding part with Magendie's solution, or a solution of cocaine.

Astringents may be given either in combination with opium or separately. They are expected to pass wholly or partly through the entire length of the intestinal canal, thus coming into contact with the inflamed and ulcerous mucous membrane. Among those most eligible are tannin, gallic acid, and vegetables containing the same (rhatany, catechu), besides subacetate of lead, nitrate of silver, and per-nitrate of iron.

The daily dose of tannin, when taken for a long time in succession, is from 10 to 15 grains; subacetate of lead 5 to 10 grains; nitrate of silver $\frac{1}{2}$ to 1 grain. The latter ought not to be given more than a month in succession, for fear of argyria, and all are best taken, if possible, in pill form, as they appear to be better tolerated, and are certainly more effective.

The use of keratin, when it becomes handier and cheaper, will facilitate their efficiency to a considerable extent.

Another antiseptic which I have frequently administered in intestinal ulcerations, both acute and chronic, is naphthalin; almost insoluble in the intestinal tract it is swept down and has an opportunity to act locally. It requires no keratin to cover it. I have used it to

some advantage in intestinal tuberculosis; with considerable profit in acute typhoid poisoning and chronic typhoid ulcerations. Indeed, in many cases of typhoid fever I have ordered naphthalin from the start, and with good results, I believe. We have to expect a great deal from such topical medication, and it appears that it will be the great refuge in all infectious diseases whose principal location is in the intestine, as for instance Asiatic cholera. Children bear, as a rule, according to their ages, from gr. ss. to ii or iii, every 2 or 3 hours, in some mucilaginous substance. Some do not bear it well, but when such is the case, the stomach will give warning at once.

The local treatment of intestinal ulcerations requires the use of enemata. Their indications vary, accordingly as they are to evacuate the bowels, or to reduce the irritability of the diseased intestine, or to accomplish an actual cure. These indications can be fulfilled sometimes two, sometimes all three, at the same time. The nature, quantity and temperature of the liquid to be injected, depend in part on the end aimed at, and in part on the irritability of the individual intestine; sometimes the bowel objects to the introduction of small amounts, while again large quantities are tolerated easily. To introduce small amounts, the selection of the syringe is a matter of indifference, provided the liquid enters the bowel easily and without pain; to inject large quantities, however, undue pressure and local irritation must be

avoided,—thus the fountain syringe alone will answer but should hang a mere trifle above the level of the anus, say from six to twenty inches. Temperature is not always a matter of great importance, for some recommend the injections to be ice-cold, some tepid, and both are frequently recommended as panaceas. However the practitioner will soon ascertain that some bear and require the one, some the other, and some indeed very hot ones.

In my experience, for the large majority of patients tepid injections answered best. Not seldom is the intestine in such a condition of irritation that even small quantities of a very cold fluid are expelled at once. And again, there are cases in which enormous amounts of either cold or warm water are readily received. To accomplish the purpose of evacuating the bowel, plain water will often suffice, but three-fourths of one per cent. solutions of salt in water will usually prove more acceptable. Additions of bitartrate of potassium, or castor oil, have proved so uncomfortable in my cases that I have discarded them long ago. However, when the secretion of mucus on the rectal and intestinal mucous membranes was very large, one- or two-per-cent. solutions of bicarbonate of sodium answered very well indeed. For the purpose of clearing the intestines, either of fæces or the morbid products, the single enema is insufficient; it ought to be repeated several times daily. When much mucus is secreted, and tenesmus intense, it

may be applied after every evacuation. In many cases the substitution of flax-seed tea, or mucilage of gum acacia, will prove advantageous. I have had to continue them for weeks for both their evacuating and alleviating effect. When, however, the latter effect alone is aimed at, that is, when tenesmus is to be relieved, small quantities will usually suffice. An ounce or two of thin mucilage, or starch-water, or flax-seed tea, with tincture of opium, or, better, extract of opium, prove very comforting. Glycerin in water has been recommended for the same purpose; the former alone, or but slightly diluted, irritates, nay cauterizes. It will require close judgment and individual experience to ascertain the degree of dilution.

When a local curative effect is aimed at, injections of small quantities will be found deficient. As the local lesions are often extensive, the amount to be injected must be pretty large. Almost always, astringents are required. Sulphate of zinc, or alumina, sub-acetate of lead, nitrate of silver, tannin, chlorate of potassium, ergotin, salicylic and carbolic acids, and creasote, have been recommended. Of the more common astringents, I prefer alumina or tannin in one-per-cent. solutions. Creasote answered well in solutions of one-half of one per cent. Salicylic acid resulted more frequently in pain than in benefit. Carbolic acid in solutions of one-half of one per cent. has proved very beneficial, but I have learned long

ago to be very careful in regard to its administration when I observed a case of poisoning with that substance. A young man suffering from chronic dysentery was to be treated with injections of carbolic acid in a one-per-cent. solution. As it was expected that but a limited quantity would be tolerated before expulsion, no amount was specified. The intestine, however, being in a paralytic condition, received enormous quantities, until finally ten drachms (40.0) of crystallized carbolic acid disappeared in his bowels. That want of caution came near destroying the patient.

Injections of nitrate of silver may prove very useful in cases not quite acute. Before the solutions of a quarter of one per cent., or of one or two per cent., are injected, the intestine ought to be washed out with warm water without salt. After the injection has been made, it ought to be neutralized with a solution of chloride of sodium; it is still better to wash the anus and the portion of the rectum within easy reach with that solution before the medicinal injection be made. For even the mildest solutions are liable to give rise to intense tenesmus when no such care has been taken.

When the ulcerations are but few, or in the lower portion of the bowels only, small quantities suffice; but extensive lesions require large injections, the patient being on his side or in the knee-elbow posi-

tion.* In a number of cases, both mild and severe, where neither the usual astringents nor nitrate of silver appeared to answer, I have been very successful when resorting to injections of subnitrate of bismuth. The drug is mixed with six or ten times its amount of water; of this mixture, from one to three ounces (30.0–100.0) are injected into the bowel, which has been washed out previously twice or three times daily. The success was satisfactory, though a large portion of the injected mixture was soon expelled.

Suppositories containing the above substances may prove beneficial. But in order not to irritate they must be so soft as to melt readily. They may always contain some opium. But its admixture is not always sufficient to relieve the irritability of the rectum. For to accomplish this end, opium must at least begin to liquefy and to be absorbed, and absorption cannot be relied upon except where a part, at least, of the mucous surface is in a fair state of integrity. When no suppository can be tolerated, and the administration of an opiate to the intestine is indicated, the painting with Magendie's solution, or the injection of a small quantity of olive oil with tincture of opium may still be tried.

* In these cases the nozzle of the fountain syringe may be lengthened by attaching to it an elastic catheter, which is introduced as high up as possible, after the same plan that nutrient enemata are to be given.

TUBERCULOSIS OF THE INTESTINE AND MESENTERIC GLANDS. "TABES MESEN- TERICA." TUBERCULAR PERITONITIS.

Primary tuberculosis of both intestine and glands is certainly very rare. In them, tubercular affections will mostly occur with general tuberculosis. Such diarrhœa as occurs in the tuberculosis of adults, I have seen only a few times in children during my entire professional life. Still, it has been observed in the practice of others, and Biedert has made the diagnosis by discovering the bacillus tuberculosis in the evacuations. What formerly has been called tubercular disease of the mesenteric glands has often been simply inflammatory swelling terminating in hyperplasia and induration. This is the result of every irritation in the neighborhood, of every diarrhœa, and thus necessitates the speedy treatment and removal of every such cause. This enlargement may also be the result of infectious diseases, such as diphtheria, typhoid fever, and scarlet fever.

These glands which in consequence of neighboring irritation become acutely congested and inflamed, are red and succulent, the blood-vessels appear in-

jected, and a rapid proliferation of cells takes place, not only in the glands, but in the surrounding connective tissue.

The newly formed cells may undergo granular degeneration in a very short time, and are transformed into pus. When this change takes place rapidly, not infrequently will pus be absorbed and enter the circulation and give rise to pyæmia, and occasionally to miliary tuberculosis.

Another and more frequent change than this, is chronic transformation of the lymph bodies together with proliferation of the lymph cells and the connective tissue. In fact, the latter will proliferate more than the former, and thus the lymph structure perishes in consequence of the pressure exerted by the newly formed, gradually increasing, and indurated connective tissue. The final result is that the lymph bodies are greatly enlarged, hard, and of a white, or grayish-white color on section.

Even this condition of things may lead to supuration in consequence of the degeneration of the central cells which are exposed to constant pressure by the external layers; or cheesy degeneration may take place.

In the majority of cases, however, no such change takes place, but the lymph bodies remain in their indurated condition, the lymph structure being destroyed and hyperplastic tissue remaining. The latter obstructs lymph circulation. Thus it is that

the presence of such enlarged glands will act as an obstacle to the absorption of chyle. The result of this has been called athrepsia (Parrot), dystrophy, atrophy, marasmus, and consumption of the bowels, *tabes mesenterica*.

It may terminate in extreme emaciation and incurable exhaustion. Anatomically, this is the same condition which shows itself in the lymph bodies about the neck.

The prevention of such a condition includes the successful treatment of the original cause, this being in most cases a common diarrhœa. When the change has taken place and the hyperplastic induration is completed, the treatment is not very promising of success. As soon as the newly-formed cells have been transformed into fibres, the ability to effect their absorption grows less and less day by day, with the exception, perhaps, of the cases due to syphilis. Still it is advisable to try absorbents, particularly the iodide of potassium, which should be continued for a long time, in doses of from 5 to 15 grains daily in aromatic waters.

When all the acute symptoms have ceased, the iodide of potassium may be followed, or combined with, the syrup of iodide of iron in doses of from 5 to 15 drops in sweetened water, three times a day.

The condition alluded to must not be mistaken for tumefaction of the mesenteric glands from other causes; thus, for instance, from primary lymphoma, or

the glandular enlargement of leucocythæmia, or from sarcoma, which occurs primarily, or from carcinoma, which occurs secondarily in young and older children.

Beside the simple secondary hyperplasia of the mesenteric glands, and the tubercular infiltrations of the same, there is a third condition which leads to the symptoms called "tabes mesenteria," viz.: chronic peritonitis. It is quite frequent, but its symptoms vary in duration and severity. While the child is emaciated, sometimes to a fearful extent, the abdomen is tumid, elliptic, its surface shining, the superficial veins dilated, and the umbilicus expanded and flattened. There is sometimes ascites, sometimes there are hard and circumscribed tumors; and the intestinal convolutions may be distinctly seen or felt. Colic and diarrhœa may be either present or absent. The temperature is sometimes normal in the forenoon, a little increased towards evening. Now and then it is high. In the former case the process may last many months, and even a year, and is capable of vast improvement; in the latter the prognosis is bad.

PERITYPHLITIS

Etiology.—The vermiform process is relatively larger and longer in the newly-born and child than in the adult. The colon of the newly-born is only four times, whereas that of the adult is eight times as wide as the vermiform process. In the fourth year of life it is six centimeters long, in the seventh, seven, and in the adult it is only ten. These anatomical differences give rise to a predisposition to the entrance of foreign bodies into the process of children; such foreign bodies are the seeds of fruits and berries, the pits of cherries, shot, hair, hardened fæces, needles, stones, etc.

The cases in which a foreign body has been found in the vermiform process in very young infants, are only few in number, for it requires some proximate cause for their admission. This is previous typhlitis or peritonitis, which results in adhesions, and greater patency with diminished elasticity on the part of the vermiform process. It is rarely that a post-mortem examination is made after fatal typhlitis without exhibiting the signs of previous inflammation in the immediate neighborhood of the process. It is not necessary that there should have been a severe



attack of peritonitis. Diarrhœa, intense constipation, dysentery, typhoid fever, are ample causes of a local peritonitis. Thus it is that very young infants are seldom the subjects of peri-typhlitis, because they have not had the time to develop the anatomical predisposition. Still, I know of the case an of idiotic boy who had been under the closest supervision all his fourteen months, and known never to have had any fruit or berry. Of the very first berry he died, a berry seed being found in his perforated vermiform process.

By the slow pressure of a foreign body in the vermiform process, a local gangrene or local peritonitis will set in which may result in exudation, in local suppuration and its capsulation, or in perforation.

The anatomical conditions found at post-mortem examinations are old or recent adhesions of the vermiform process, one or more perforations, the foreign body escaped or still in the aperture, abscesses in different places, sometimes in the immediate neighborhood of the process, which is in its normal position, sometimes both abscesses and process being found upward and behind the colon, sometimes general suppurative peritonitis, and not infrequently, old cicatrices of different kinds and in different locations.

Symptoms.—The first attack is very sudden. There is a sharp pain in the ileo-cæcal region, which remains in this neighborhood in most cases. But I

have seen cases, in which there was but little pain in the ileo-cæcal region, but very severe pain in the middle of the transverse colon.

Vomiting is not infrequent, first of the contents of the stomach; finally fæces may be thrown up. In some cases the vomiting is only slight, in spite of general peritonitis.

An eight-year-old boy whom I saw on the 24th of September, 1880, had swallowed a cent two weeks previously, without bad consequences. On the 22nd he went to school feeling perfectly well, but was suddenly seized with pain at ten in the morning, was forbidden to leave the class, and had to remain until twelve o'clock. The pain was constant, and bent over, he succeeded in getting home and to bed, but not to get up again. The pain was in the right side of the abdomen where there was a localized swelling. The right thigh was drawn up; there was dulness on percussion over the swelling in the right hypochondrium. On the 24th, when I saw him, he had vomited only twice, though peritonitis was general, and he did not vomit again. On the 25th he sank rapidly. At the same time the temperature in the rectum fell to 97° F. On the 26th, at the autopsy, there were found very strong adhesions between the coils of intestines themselves, and with the mesentery and abdominal wall. One pint of pus and many poppy seeds surrounded by hard fæces were found in an abscess about the vermiform process, in which there was

one perforation, two gangrenous spots, besides an angular adhesion of the process to the colon, of very old date.

There is but little urine, and micturition becomes painful after a little while in consequence of the pericystitis (the peritonitis extending in the direction of the bladder).

The abdomen is tense and the distension becomes extreme. The thighs are drawn up, in many cases, but not invariably. About this time cautious percussion reveals dulness, which will increase. There will also be fever, which may reach 104° or 106° F. General peritonitis will set in, and henceforth the exudation cannot be recognized by percussion. Death may take place either by exhaustion or with the symptoms of perforation.

Additional symptoms which, sometimes, are very troublesome in the course of the disease, are peripheral pains along the right lower extremity.

The diagnosis is made from the sudden attack of pain, the fever, the circumscribed swelling, the result of percussion, and by the presence of secondary local or general peritonitis. That, in several cases, the pain may be most marked in the transverse colon, should be remembered. The diagnosis from stercoraceous typhlitis is not always easy, but in children, constipation is not so frequent as it is in the adult.

The termination of the disease may be by adhesions and cicatrization, or local formation of an ab-

abscess which becomes capsulated, perforation of the abscess into the peritoneal cavity, peritonitis without perforation, perforation into the intestine, with frequent recovery, or into a ureter or the bladder, temporary momentary improvement and the reappearance of the abscess inside of the peritoneal cavity, between the adherent intestines, perforation externally, the skin first becoming reddened and rupturing. In these cases fistulous openings are frequent, and now and then anus praeternaturalis.

The course of the disease, when acute, is from three to eight days in children, more, however, in the adult. When chronic, and if the abscess be capsulated the disease may run a long course.

Even with the greatest caution and care, relapses are frequent. Pain and fever will return, either in consequence of the presence of chronic peritonitis or the capsulated abscess. Now and then, in later years, intestinal obstruction may occur, caused by the chronic peritonitis, or the bending of the intestine on itself by the adhesions which have taken place. Thus the prognosis in peri-typhlitis is always dubious. Still recoveries take place, and are not so uncommon as they have been presumed to be.

Treatment.—Absolute rest is required. The patient must use the bed-pan and urinal. Incipient peritonitis must not be disturbed. Recent adhesions are very apt to be torn and give rise to new attacks. An ice-bladder is to be applied at once to the right hy-

pochondrium. Opium must be given freely. No purgatives, no injections. The injection, first of oil and afterwards moderate quantities of soap-water may, however, be indicated after a week or ten days. The food must be liquid, and given in small quantities at a time. The patient is expected to be in bed weeks after apparent recovery. If the child gets well he must be kept very quiet, for an abscess may be capsulated and perforation may occur.

When the diagnosis is clear, there is no objection to an antiseptic puncture, which may be repeated a number of times for the purpose of ascertaining whether there is pus or not. For the very first symptoms noticed are very often those of perforation. When pus is formed, an incision must be made at once and the parts drained. In chronic cases with a great deal of inflammatory exudation, the protracted use of iodide of potassium will yield good results. After recovery, purgatives should not be given for a long time. But as a matter of precaution, warm enemata must be taken every day.

PARATYPHLITIS.

As there is a difference between peri- and parametritis, so there are cases of para-typhlitis to be distinguished from peri-typhlitis. In these cases, local inflammation, exudation, and suppuration, have nothing to do with the vermiform process, but they are in the copious connective tissue, between the pelvis and the colon, which at that place is not covered by peritoneum. Such abscesses are the result of trauma sometimes; not infrequently of pelvic abscess; inflammation of the psoas; caries of the vertebræ; sometimes no cause can be found. They will develop rapidly and become very large, so that pints or quarts of pus may either be discharged spontaneously or be removed by incision. But suppuration will not always result from this inflammatory process in the connective tissue.

A boy of twelve years, whom I saw with Dr. S., had undergone considerable exertion on March 14th, 1885, upon his roller-skates. On the 15th he complained of lassitude and fatigue. On the 16th, of trifling pain accompanied by a sensation of heaviness. On the 17th, of heaviness about the abdomen, pain

while urinating, and he objected to studying. On that day he commenced to vomit. On the 19th he had a rectal temperature of 102° F. The pain was considerable in his right inguinal region. There was hardness and dulness, and both increased, and meteorismus developed. The pain also increased in severity, but never to an extraordinary degree. There was no peritonitis, no suppuration, no intestinal disorder, but for recovery many weeks were required, and daily doses of from twenty to thirty grains of iodide of potassium.

INVAGINATION OR INTUSSUSCEPTION.

It consists in the slipping of a part of the intestine into the lower adjoining portion. Thus, a part of the colon may be invaginated into the colon; of small intestine into small intestine, or small intestine into large intestine, and particularly the ileo-cæcal valve into the colon, dragging the small intestine with it. Twenty-five per cent. of all the cases under observation occur under one year of age, fifty-three per cent. under ten years. Two thirds of those under a year are between the fourth and sixth month of age. Of eight cases, six occur in boys and two in girls. The youngest I have seen, occurred in a boy eight weeks old. Most of the babies affected have been known to be perfectly healthy. In a few cases, constipation has been said to be a possible cause. It does not appear that it is caused by diarrhœa. Baginsky and Biedert deny the possibility of its occurring suddenly as the result of a blow, a fall, or a jump. But in one of my cases, jumping while playing on the father's arm, was undoubtedly the cause. A case published by Dr. Wohlfahrt, in one of the early volumes of the *American Journal of Obstetrics* (1869), which I had an op-

portunity to observe, was caused directly by a severe spell of whooping-cough.

In babies of this age, seventy per cent. of the cases take their origin at the ileo-cæcal valve. This valve has very strong circular fibres, and thus is apt to slip into the somewhat wider colon below. Besides, in this very region the intestine is loosely attached to a very flabby mesentery, and this part of the intestine is frequently filled with fæces; now and then it is the seat of a small tumor, the irritation and pressure of which will also favor the occurrence of invagination.

The invagination, inasmuch as one part of the intestine is enveloped by another, has naturally three layers; the external and middle layers touch each other by mucous membrane; the inner and middle layers by peritoneal covering.

The mesentery is drawn in with the intestine, and thereby the invaginated portion is turned and twisted, and the whole mass becomes more firm and irreducible. A large portion of the small intestine is, now and then, contained in the invagination, but that is the result only of its being dragged in mechanically. As a result of invagination, there are disturbances of circulation in the mesentery and intestine, such as œdema and hyperæmia. There is consecutive peritonitis, particularly where the intestine is folded upon itself. Sometimes, in consequence of stricture, gangrene occurs, and will be seen in different stages, from slight superficial sloughing to perforation

Symptoms.—The healthy child is suddenly taken with colic and screeching. There are one or two movements from the bowels, with considerable straining, which may or may not contain fæces; at all events, *they contain mucus mixed with blood, or clear blood.* Sometimes a number of evacuations will follow each other and contain only blood. There is no fever. The child looks pale and collapsed after a very short time. The pulse is very small. At the same time the abdomen remains soft.

Vomiting commences very early; at first it is yellow and greenish, and after a while feculent. The children, after having become accustomed to their suffering, will appear to be better in a certain number of cases. This apparent improvement is only temporary.

In a number of cases an oblong semi-elastic tumor is perceptible, mostly in the right side of the abdomen, corresponding with the location of the colon. This tumor may extend or change its situation, for in not a few cases the invagination will increase to such an extent that it can be felt in the rectum, and sometimes is so long as to pass through the sphincter. After one or two days, peritonitis develops with fever, and at that time the abdomen becomes swollen to a greater or less degree. The tumor which may have been previously detected is no longer perceptible, and the baby may die of exhaustion or in an attack of convulsions.

The prognosis is doubtful in every case. Recovery may take place and be complete or only partial. The intestinal layers may adhere to each other, become gangrenous, and a portion of the intestine be thrown off. I have seen two such cases in children. Such a spontaneous recovery by elimination is said to take place in the first year in two per cent., from the second to the fifth in six per cent, from the sixth to the tenth in thirty-eight per cent. of the cases, or gangrene may not occur but the surfaces of the intestine remain adherent. In those cases the entire lumen of the intestine remains small. I have not seen such a case.

Relapses are frequent. Dusch has seen 22 relapses in one month in the same case. I have seldom seen them. Most of the cases which do get well, recover entirely. A long continuation of morbid symptoms, such as Baginsky speaks of, I have seen but seldom.

The diagnosis of the cases is mostly made by the suddenness with which the symptoms appear, the sudden colic followed by faintness and collapse, the bloody passages followed by vomiting, the absence of fever, and the presence of a tumor.

In volvulus, which means twisting of the intestine around its own axis, or around another intestine, or around a diverticulum, there is no blood, nor is there any blood in the case of obstruction by intra-intestinal or extra-intestinal tumors, or by cicatrices, or by stercoreous typhlitis.

Epstein and Crips report cases of *congenital* twisting of the intestine, from duodenum to colon, round itself. The infants lived several (5, 10) days. Also at birth, and at a later period, we meet with ligaments dating from foetal or infant peritonitis, as the cause of twisting. Of the remnant of the omphalo-mesenteric duct, mention will be made.

In one case seen with Drs. Huber and Neufield, we excluded intussusception by the absence of bloody mucus or blood from the few movements the baby had. In that case, laparotomy being performed, we convinced ourselves that there was no invagination. The operation was unsuccessful inasmuch as it had to be given up because of the condition of the baby, but we found that, in all probability, the obstruction was due to the fact that the right kidney was absent from its normal position, and was fastened in the right inguinal region. Very probably, though this observation could not be verified by a post-mortem examination, the displacement of the kidney was in some way the cause of the obstruction.

Treatment.—The only successful treatment consists in the reposition of the intestine. When that is successful, there is immediate relief. The anxious expression and collapsed condition improve instantly, the patient will go to sleep, and soon eat. In the beginning of my practice I used large stomach sounds for the purpose of reducing the invaginated mass, but I have almost invariably found the case to

be worse afterwards, because the sound will crowd the parts upon each other. I have also blown air into the intestine by means of bellows, and in order to make the supply more regular, I availed myself, twenty-five or thirty years ago of an apparatus for the production of carbonic acid gas. After that time, when the siphons containing carbonic acid and mineral waters were invented, I used them for the purpose of filling the intestine more or less slowly with both gas and water. All these measures have proved successful in occasional cases. What has done me better service, however, is the following simple plan. The baby is turned on its belly, the hips are raised, the abdomen gently supported by a soft pillow. The mouth and nose being the lowest part of the body, must be well protected. The baby is then anæsthetized with chloroform, and warm water is poured into the rectum with but little pressure. The injection is frequently intermitted, while the anus is closed by the finger. At the same time the abdomen, in the direction from below upwards, is gently kneaded and its contents moved about.

In not a few cases have I seen immediate result from this treatment in the course of the last twenty years. When reduction has been completed, the baby must be kept absolutely quiet, take opium, now and then a rectal injection of chloral in solution, and wear an abdominal bandage just tight enough to steady the bowels.

In adults, Kussmaul reports favorable results from washing out the stomach. When the simple measure which I propose is unsuccessful, after a number of trials, laparotomy ought to be performed. The successful cases of laparotomy are not very numerous, but sufficiently so to justify the operation of the only means that promises a favorable result in irreducible cases. Henry B. Sands and F. Kammerer, of New York, have saved babies of six months by this operation, and there are other similar cases on record. It is necessary to operate in time, and not delay too long; for, at best, laparotomy, in these cases, has its unusual difficulties.

At an early period all the tissues involved are hyperæmic and soft, with a tendency towards gangrene. In a child of eight weeks, on whom I operated, it took me ten minutes to separate the parts from each other, although I had the invagination, measuring six or seven inches, outside of the abdominal cavity. This delay was due to the softness of the tissues, and the close impaction of the three layers and a large amount of mesentery. Besides, the field of operation is very small and the difficulty of returning the intestine into the abdominal cavity very great indeed.

PARASITES, WORMS, WORM DISEASE, HELMINTHIASIS.*

The intestinal parasites found in children belong to two classes, the nematodes and cestodes.

1. *Nematodes.* *Trichinæ* behave in the child as they do in the adult. They are found in the upper part of the small intestine. They are usually matured two and a half days after the diseased meat has been eaten, the young worm makes its appearance five days afterwards, and then begins to migrate to the muscles. This process may last from four to five weeks. The female is from three to four millimetres in length, and is recognizable by the brood inside. The male measures only one and one-half millimetres.

Ascaris lumbricoides has a shape very much like the common earth worm, pointed anteriorly, flat and rolled upon itself posteriorly, with three lips anteriorly, and yellow-brownish ova with a double shell. It is mostly found in the middle part of the small intestine, not infrequently in the duodenum, and likes to migrate to the stomach, and is then expelled. The female is from 25 to 40 cm. long and 5 mm. thick, the male 15 to 25 cm. and 3 mm.

* Johannes Orth Text book of Pathological Anatomy, 1887.

Oxyuris vermicularis (pin worm). The male is not over one-half centimetre (one-fifth of an inch) in length, and is rounded behind. The female measures one centimetre, is pointed, and much more numerous. The ova are very small, not over $\frac{1}{800}$ th of a millimetre in length, some only $\frac{1}{8000}$ th, oval, more arched on one side. The shell is composed of three layers and very thin. The worm lives in the whole intestine, the male and young mostly in the small intestine, the pregnant female in the cœcum; for the purpose of depositing its eggs it descends to the rectum. In the ovum the embryo is often in full development.

2. *Cestodes. Tænia solium* (pork tape-worm). When of full length it measures from two to three metres (six to ten feet). It develops from the cysticercus of the pig. The head has the size of the head of a pin. It carries four suckers laterally, each with a crown of hooks, and the rostellum, a protuberance which in old specimens is of a black color. The neck is an inch in length, very thin, so that its articulation can be recognized by a magnifying glass only. The several apertures are located laterally on the right and left alternately. The uterus has from seven to ten lateral branches, around which there are often dropsical enlargements. The proglottides behind the neck are broader than they are long, a meter behind this part they are square, and below that longer than they are broad. The ovum is spherical, about $\frac{1}{300}$ th of a millimeter in size, with a thick membrane and with one or more radiated stripes.

Tænia mediocanellata (beef tape-worm). It grows from the cysticercus of beef, and is therefore the tape-worm of small children by preference. Its full length is four metres (twelve to thirteen feet). The head is of heavier build, and has four suckers, but no rostellum and crown of hooks. In old specimens it is black. Below the head the articulation of the neck is visible to the naked eye; the proglottides are thicker and heavier, the mature ones longer than they are broad. The sexual organs resemble those of *tænia solium*, only the uterus has about twenty-five lateral branches with simpler structure and subdivisions; the ova are like those of *tænia solium*, but thicker and more oval.

Bothriocephalus latus (Broad tape-worm). It develops from the cysticercus of fish and is therefore mostly seen on the shores of the sea and lakes. Its full length is from five to eight metres. The head is rather long and flattened laterally, with two suckers on the thin side; uterus small and less distinct; the sexual organs on one side. Sometimes they appear fenestrated, in consequence of the bursting of the sexual apertures. Thus a genuine fissure may occur, which yields the impression of a double development. The ova are oval, $\frac{1}{750}$ th of a millimeter long, $\frac{1}{800}$ th of a millimeter broad, with amorphous contents, and a brown shell exhibiting something like a cover on one of its sides.

The symptoms depending on the presence of one

or numerous worms in the intestinal tract vary in number and nature. All of them can be referred to other diseases; thus it was that worms were once (still?), next to colds and dentition, the great etiological bugbears. Therefore the diagnosis of worms—helminthiasis—ought not to be made unless either worms, or parts of them, or their eggs have been found—macroscopically or microscopically—in the movements. To conclude that there must be worms “dissolved” when the evacuations are replete with mucous and misunderstood material, is fortunately the mistake of bygone times only.

The symptoms belong either to the abdominal organs, or by reflex, to distant ones, and then they are of neuropathic nature. There is, or may be, pain, of intermittent character, often improved by milk and fatty food, increased by salty, aromatic and acid substances (fruit). Appetite normal, diminished, or increased. Stools costive, loose, sometimes mucous, and may contain eggs or worms. Vomiting may occur though there be no ascaris or oxyuris in the stomach. Vogel reports the case of a baby of nine months, who, after having been fed on farinaceous food for three months, brought up an ascaris by vomiting. Sometimes the children look pale, apathetic, and swelled over face and lips. This tumefied—œdematous—appearance, *and* the helminthiasis, are probably the coördinate results of coarse farinaceous feeding. There is the pruritus of, and boring in, the

nares, common to many digestive and respiratory diseases. In some cases the pupil is certainly dilated. There are mild or severe nervous symptoms besides, such as restlessness, sleeplessness, choreic movements, or epilepsy (rare). Vogel saw a child dying with what appeared to be hydrocephalus. At the autopsy there was none, but there were one hundred ascarides which obstructed and reddened the intestine.

The pruritus and local irritation may be, according to Biedert, more than mechanical, they may be chemical. He quotes Huber, who, after having examined a number of ascarides in the course of an hour, experienced beside the pungent odor, pruritus of the hands, local urticaria, and conjunctivitis.

Oxyuris is apt to emigrate to the perineum, vagina, and prepuce. It will give rise to irritation (frequent scratching), catarrh and masturbation.

Ascarides will pass spontaneously when the intestinal tract is in a morbid condition. A worm wants healthy surroundings, and the morbid change of the intestine is, as a rule, not the result of the presence of the worm; on the contrary, the latter makes its voluntary exit when it begins to loathe its quarters. But it will also migrate to the stomach, œsophagus, nose, larynx, vermiform process, pancreatic ducts, and choledoch duct. Liver abscesses have been found (Davaine, Scheuthauer) to contain putrid ascaris or its egg. Ascaris has made its appearance through the umbilicus, either through an open diver-

ticulum of Meckel, or through the ulceration of an adhering intestine. It has been found in the abdominal cavity; and was known to give rise to fatal peritonitis. The perforation of the intestine through which the worm escaped, may have existed, and the worm availed itself of the proffered opportunity. Or it may have forced its own passage. Such authorities as Siebold and Leuckart are of the opinion that the small lips of the ascarides are hard and sharp enough for that purpose.

Tape worm is apt to give rise to colic, vomiting, loss of, or craving, appetite, diarrhœa, hiccough, and nerve disorders of many kinds, but the diagnosis cannot be positive except when proglottides have made their appearance.

Treatment.—The medicines available for dislodging worms are all irritant. They must not be given unless the diagnosis has been made positive. It is better that the diagnosis of a gastritis, enteritis, or meningitis should be made by the medical man, than that the child should be punished for his carelessness. Before taking anything to expel tænia, a child ought to be in fair general condition. Moreover, its own tænia, the mediocanellata, is the most difficult to expel. The best time is when proglottides are seen in the movements. Moderate abstinence, and a purgative (castor oil) ought to precede the administration of drugs. The worm must be expelled, for though the symptoms may not be urgent, some day there will

come either local and reflected ones, or a possible invasion of cysticercus into some vital (brain) or important organ (liver, spleen, lung, ovary).

Spontaneous emigration will be noticed occasionally, but it is rare and not to be expected. After the successful termination of the cure, the intestine must be allowed rest. The plainest diet, such as milk and strained farinacea, and peptones, are indicated for days.

I have administered a great deal of kamala, sometimes 10-15 grammes ($\frac{1}{2}$ -1 ounce) during one hour, early in the morning, the breakfast (milk) to be postponed for two hours. The effect was not uniform, and often negative. It was improved by giving a dose of 25 centigrammes to $\frac{1}{2}$ gramme (4-8 grains) four or five times daily, for ten days or more, previous to the larger dose. A few hours after the larger dose, castor oil ought to be given.

Kousso, 3 to 15 grammes within two hours, after the required preparation, to a child of from 2 to 10 years.

Extract of filix mas has proved most successful in my hands. A small child may take 1 gramme (15 grains) in an aromatic mixture within one early morning hour. A drachm is tolerated and required by a child of 7 or 8 years.

Pelletierine tannate is given in doses of 1 or 3 decigrammes (0.1-0.3 = grs. iss to v). I have but little experience with it. It is obtained from cortex

punicæ granatum, which was (and is still) given as a decoction, but is too disagreeable, and sometimes dangerous, a mess for a child or infant.

For the removal of ascaris, the general preliminary treatment ought to take place; at least, the bowels ought to be moved gently. The powdered sem. cinæ, or flor. cinæ, 1 gramme or more, mixed with a syrup, and followed by castor oil, will work well. Santonine, which is obtained from it, works as well and more pleasantly. From 1 to 6 centigrammes (gr. $\frac{1}{6}$ — $\frac{1}{2}$ —1) several times a day, with a purgative such as magnesia, calomel, or jalap. The latter addition is desirable, inasmuch as now and then poisonous symptoms may appear. Other children will complain of "xanthopsia," yellow vision. Urine and conjunctiva are yellow, sometimes.

As oxyuris vermicularis is frequently found in the rectum, or its neighborhood, the internal administration of drugs is not the only thing indicated. The external results, such as vaginal catarrh, must be treated locally. The worm is removed by a small piece of blue ointment introduced into the rectum, or rectal injections of vinegar and water (1 : 5-4), corrosive sublimate (1 : 1500-6000), or decoctions of onions or garlic. It is difficult to dislodge, as it also inhabits the colon and even the small intestine.

There is another parasite, the *anchylostoma duodenale*, which for some years has attracted a great deal of attention.

The male is from 6 to 10, the female from 10 to 18 mm. in length ($\frac{1}{3}$ – $\frac{1}{2}$ inch). The mouth is bell-shaped, there are two dental prominences above, and four below. Particularly the female is thus characteristically endowed, so that it sucks and bites at the same time. Eggs are found in the fæces. They are smaller than those of ascaris. It was found in large numbers amongst the Italian workmen of the St. Gothard tunnel, the tile laborers of the Rhenish provinces, and the Hungarian miners and their children. The cause of its presence is looked for in the muddy water they drink, which is filled with the ova, and the clay they work in, which contains the larvæ. The general symptoms are very severe and dangerous. Debility, paleness, utter exhaustion as in pernicious anæmia, relative diminution of red blood cells. This "Egyptian chlorosis" was explained by Griesinger, by the presence of anchylostoma, as early as 1854. Besides, there is pain in the epigastrium, constipation, mucous and bloody discharges, sometimes real hæmorrhages and dyspnœa. It requires santonin, thymol (adults took 2 to 10 grammes daily), and principally extract. filicis maris æthereum.

INTESTINAL MALFORMATIONS.

The intestine of children is normally longer than that of adults. Up to the ninth, even to the twelfth year, its capacity also is greater than that of the intestine in the adult. An abnormal length of parts of the intestine may occur anywhere, but particularly where it is attached to the mesentery.

There is a malformation that has been called partial duplication, or reduplication. It is in fact not this, but a diverticulum, so-called by Meckel. This is met with sometimes in the newly-born, above the ileo-cæcal valve; in the adult, sometimes a little higher or a little lower; occasionally even in the colon, where its aperture is quite large. It extends from two to ten centimeters, or more, in the direction of the umbilicus, to which, now and then, it is attached by a filament. This diverticulum is nothing but the remnant of the original omphalo-mesenteric duct. Sometimes the whole diverticulum is attached, inside, to the umbilicus, making a cul-de-sac or cloaca. Sometimes it penetrates the umbilical ring, or is attached to the peritoneum below the umbilicus, or it terminates in the umbilical ring with a fistulous opening, or it ad-

heres somewhere to the abdominal wall. Sometimes the adhesion to the abdominal wall is only partial, and then meconium will enter the abdominal cavity. This is found mostly on the side not covered by mesentery. In rare cases it is separated from the intestine, and then is apt to form a cystic tumor. Now and then there is necrotic destruction of the umbilicus, with pyæmia or septicæmia, or a fistula resulting therefrom. Now and then the diverticulum gives rise to twisting of the intestine at any time during later life. Not all cystic tumors found in the abdominal cavity, however, in or near the intestine, are of the same character. Some of them belong to the class of teratoma (fœtus in fœtu).

Very small cystic tumors have been found in the colon, soon after birth. Most of them appeared to have been developed after dysenteric processes, and to be the results of local extravasations. Some may originate in exudation; some, however, are retention cysts belonging to the class of those which grow out of swelled glands with obstructed ducts, and follow a chronic inflammatory process in the mucous membrane of the large intestine. The localization of the dysenteric process in the lowest part of the intestines explains why such cysts are absent from the small intestines. The only case in that neighborhood, in the newly born, I know of, has been reported by Dr. Eugene Frankel, of Hamburg, in *Virchow's Arch.*, Vol. 87, 1882, p. 281. It gave rise to very serious

symptoms of complete obstruction, and terminated fatally. The specimen dates from 1851, and was taken from a female child after she had died on the eleventh day. When she was born, and during two days, she ate and defæcated normally. Then vomiting set in. The obstruction was complete, food and fæculent matter being thrown up. Drastic purgatives resulted in evacuations and subsequent diarrhœa, requiring constipating administrations. Two days afterwards again constipation, drastics again, and no effect. At the autopsy the large intestines were found empty, the small intestines inflated with gas; at the lower end of the ileum there was a spherical cystic tumor between mucous and serous membranes of a diameter of $2\frac{1}{2}$ cm. (1 inch), obstructing the lumen of the intestine almost completely, even in the dead body.

A very important malformation of the intestinal canal is partial or complete obstruction, stenosis or atresia. Besides the atresia which can be produced by cystic tumors, as described above, there is, now and then, a duplication of the mucous membrane, which is apt to produce obstruction like the hymen in front of the vagina, and close the entrance to the cavity either partially or completely. Sometimes the obstruction is so complete, that nothing is left of the intestine except a filament. In that case the corresponding part of the mesentery is also absent. This condition has been observed in a few cases, particularly in the duodenum, mostly about the entrance

into the ductus communis choledochus, and also in the ileum. It has been regarded as the result, either of fœtal peritonitis, or of the twisting of the intestine in an early embryonic or fœtal period, but it is the result, particularly in the rectum, of actual arrest of development of this kind.

I published a rare case in the *American Medical Monthly*, 1861. It was that of a male infant 39 hours old. The child had no evacuation of the bowels for the first twelve hours after birth. A medical man was called in, who removed some obstruction by means of his fingers from the anus, and gave an injection, whereon a string-like, hard, solid, whitish mass was removed. The child then was declared to be all right, and he left. Nevertheless, no regular passage was had, but the patient evacuated a mass like that described, but less in quantity, several times. He commenced vomiting, however, bringing up a black substance, which was afterwards changed into a brownish or yellowish-gray mass by the addition of milk, which the child would readily take from the breast. When the infant was presented he still looked well-developed; no deformity was perceptible on any part of the body. Exhaustion began to show itself, from the somewhat collapsed face and sunken fontanelle. Abdomen not much inflated; only across it, below the liver, and a little downward to the left, an intestine was both seen and felt. It was inflated with gas, which appeared to be unable to escape. The

rectum was very narrow, but could be explored to the length of the fifth finger, and no perfect impermeability found. The fæces removed last were pretty greenish, solid, about a fifth of an inch in diameter, and completely formed. Having no other means of diagnosis ready, the case was declared to be one of stricture of the intestine, somewhere between the colon transversum and rectum. The last evacuation, however, was subjected to a microscopical examination, and found to contain a uniform mass of cells, of average size, with nuclei and some nucleoli, no fat, hair, cholesterine, nor large epithelial scales; thus the evacuation was set down as intestinal mucous only, not as meconium. On the next day the substance thrown up from the stomach was submitted to microscopical examination: and found to contain, besides milk, some crystals of cholesterine and a large number of large epithelial scales. The case was then set down as one of complete impermeability of the intestine, as there were constituents of meconium above, but not below, a certain point.

Patient died with the symptoms of exhaustion, when seventy-two hours old. Post-mortem examination was made nine hours after death. Rectum very narrow, as described above. Beyond, the colon appeared only about a fifth of an inch in diameter, but could be inflated up to the vermiform process; no air would pass the valve. A tube was then introduced through a small incision above the ileo-cæcal valve,

and inflation attempted from above downward; but no air would pass the valve, thus showing perfect impermeability. The whole colon and rectum had a length of about fifteen inches. Stomach normal, perhaps a little larger than usual. Duodenum and upper part of the intestine, to a length of about fourteen inches, very much dilated, and terminated in a very large *cul-de-sac*, no opening being found into the remaining part of the intestine, which all of a sudden became of a decidedly diminutive size, of perhaps a fifth of an inch in diameter. This was the size of the intestine all through its length down to the valve, with the following exceptions. As stated, there was no connection whatever between the dilated upper portion of the intestinal canal and the suddenly contracted part, both of them ending in a *cul-de-sac*. Below this, about two inches from this first impermeability, the contracted intestine again ended in a *cul-de-sac*, after which, to a distance of eight lines, no intestinal cylinder whatever was found, the mesentery hanging free in the abdominal cavity. Then, again, a small intestinal cylinder of nine or ten inches in length, was found closed on either end. Again, the mesentery without its intestinal appendix for about eight or nine lines. Again, an intestinal cylinder of the same length. Again, absence of intestine for a similar distance. A third intestinal cylinder of the same length, closed on either end, followed this; and again, at last, free mesentery for about half an inch.

Then, finally, the intestine fairly began again, uninterrupted in its lumen, and unchanged as to its diameter of about a fifth of an inch, and measured, down to the ileo-cæcal valve, twenty-two inches. Thus, the whole length of the intestine, including altogether, two inches of mesentery not accompanied with intestine, was about four feet and a half, exhibiting in its course, besides the dilatation of the upper portion, a nearly equal coarctation of the lumen, the colon being a little larger than the rest, and the rectum not so narrow as the colon itself, two perfect impermeabilities; and beyond these four total interruptions of the course of the intestinal canal, the free intervals being, in the average, eight or nine lines in length.

Liver, spleen, kidneys and bladder perfectly normal. Both of the kidneys contained beautiful specimens of the so-called uric infarcts.

Cases like the above are more than merely rare. Perhaps there is, beside an important case in Ammon's Atlas, and Küttner's and Hüttenbrenner's cases, not more than a half a dozen on record. In Küttner's case the jejunum ended in a *cul-de-sac*; then there was a piece of intestine three inches in length, ending in a *cul-de-sac* on either side; further, a second of the same description; finally, a third one, five inches long. Then, at last, the colon commenced with a *cul-de-sac* above, and ended in a normal anus.

A similar case was one I saw with Dr. Henry Schweig, nearly thirty years ago. With similar anatomical changes, constant vomiting soon after swallowing food, the baby lived thirty-five days. Some of these patients exhibit a remarkable vitality indeed. A case kindly sent by Dr. Huntington, of New Rochelle, to my college clinic, more than ten years ago, was heard of when thirty-three days old. How long it survived afterwards, I have not learned.

As already stated, most of the changes occurring in the rectum are due to arrest of development. The posterior end of the alimentary canal forms, about the fourth week of foetal life, a cloaca together with the allantois. In its anterior end are the sexual ducts. The anterior part of the cloaca is open; the posterior end, corresponding with a later formation of the intestine, is closed. The two parts are soon separated, by the canal being bent in at its posterior end, into the uro-genital sinus and the rectum. The first partial septum is the primary perineum. It grows gradually, and then separates the opening of the anus and the sexual organs.

Malformations of the rectum may be of different kinds.

First, the anus is present; atresia of the rectum is far inside. It may have been the result of twisting, and then two *cul-de-sacs* of the intestine may be found in different positions towards each other.

Second, there is no anus. The rectum opens by

a fistula in the perineum; or in the raphe of the scrotum; or in the vulva. Evidently, in embryonic life the septum was formed too near what was later the sexual opening.

Third, there is no anus. The rectum terminates in a fistula attached to the mucous membrane of the uro-genital organs. In these cases everything is normal except the original peritoneal septum, and the part of the intestine which should have developed from the cloaca missed its development. There are, sometimes, other malformations connected with this anomaly.

Fourth, there is no anus. Sometimes it is indicated by a dimple. The intestine terminates in the neighborhood of the promontory. Between the perineum and the intestine there is absolutely no remnant, with the exception of a few cases in which a residual filament has been found.

In these cases it is possible to assume different causes.

First.—Inflammation and conglutination.

Second.—Arrest of development, perhaps connected with an excessive absorption of the *pars caudalis* of the spine.

Third.—The primary perineum may have developed posteriorly to an abnormal degree, thus separating the intestine above from the remnant of the posterior part of the cloaca, which was to become the anus.

Fourth.—There may have been developed a diaphragm, hymen-like, from the part of the mucous membrane, as alluded to when the upper part of the intestinal tract was under consideration.

When the original embryonic abdominal fissure remains patent, the newly-born may have an ileum or colon which is also open.

The vermiform appendix may be absent, or nearly so.

The small intestine, also the large, may be too short, and the difference between the two may be but very small.

There may be *anomalies of position*. The intestine may protrude through the abdominal fissure; through a fissure in the diaphragm in its left half; through the natural openings, the inguinal and femoral rings, and others.

Transposition of the intestine may occur independently or in connection with other transpositions. This anomaly is the result of the fact that the intestine has to go through a series of changes of location before it assumes its natural shape.

The colon ascendens or transverse may be entirely absent.

There are not infrequently small, tumor-like bodies in the walls of the small intestine. Sometimes they have been found at the apex of diverticula. They are the result of a few pancreatic cells separating from the main body at a very early period of embryonic life.

The symptoms of imperforate rectum and atresia ani are as follows: No evacuation, no anus, or the exploring finger gets into a *cul-de-sac* half an inch or an inch below. Sometimes, however, the obstacle is very far beyond the finger's length. The colon begins to distend, now and then with dullness on percussion. The swelling may show itself in the hypochondrium first and extended to the right inguinal region along the lengthened sigmoid flexure. Vomiting at first yellow, afterwards of meconium. Inflation not always uniform of the whole abdomen; pain, dilatation of the external veins, superficial thoracic respiration, elevation of temperature and other symptoms of peritonitis.

Treatment.—In view of the fact that the imperforate condition may be but apparent, injections ought to be tried often and copiously. If unsuccessful, they ought to be followed by operation, performed for the purpose of either joining the two unconnected *cul-de-sacs* or drawing the rectum downwards, or if that be impossible, of establishing an artificial anus in the right or left side.

HERNIA.

Umbilical Hernia.—It is found in two forms: First, *congenital*; second, *acquired*.

Congenital umbilical hernia, also called exomphalus, or congenital ompholacele, is the result of a genuine arrest of development of the abdominal wall. The embryonic fissure of the abdominal wall, which should have closed about the seventh week of embryonic life, remains open. There is found in it a large part of what is to become the intestinal tract, and the abdominal wall is not closed; thus the tract remains outside, and is covered by peritoneum only. When the fissure is very large, the liver and a portion of the stomach will also protrude. If so, the case becomes more favorable after the child is born. That is when the large liver is included in the protruding parts, the neck of the hernia remains large, and it may be reducible. When, however, the intestine alone is enclosed in the hernia, the neck of the sac will contract, and there is no possibility afterwards of reducing it.

In the sixth volume of Gerhardt's Handb. d.

Kinderk. Kocher reports twenty-four cures of congenital ompholacele, by means of reposition, and in the *Vienna Med. Monthly*, 1887, page 1145, C. Brenz reports the case of a girl who weighed 2,700 grammes and was born with an umbilical hernia. Reduction without opening the hernial sac, he found to be very difficult, but after it had been accomplished he compressed the sac by means of a pair of pincers, removed the sac, which contained peritoneum and amnion, with scissors, applied three per-cutaneous ligatures below the clamp, removed the clamp, applied the Paquelin cautery to the stump, and covered it with antiseptic dressings. He removed the dressings and the ligatures on the eighth day. The case proved successful, although there was peritonitis as early as twenty hours after birth.

A rare case of the kind has been reported by Dr. E. A. Martin in the *Med. Record* of Sept. 24th, 1887. It is, moreover, complicated with either a complete absence or complete fissure of the sternum (like the celebrated Groux case). "There is a deficiency in the abdominal wall, the recti abdominis being separated or non-developed, and there is an umbilical hernia, which, during straining, protrudes as large as the clenched fist. The convolutions of the small intestine can be readily seen through this thin covering. The child is still living at this writing (four and a half months), and has developed an inguinal hernia of the right side. Weight about same as at sight."

A predisposition to acquired umbilical hernia is produced by the large size of the cord and navel, by leanness and feeble development of the child, by attacks of colic, screaming, coughing, straining in consequence of diarrhœa or constipation, phimosis, or anal fissure.

The hernia contains small intestine and peritoneum. It develops gradually until it may reach the shape and size of a pear, or even become larger. It shows a uniform surface with the exception of a small spot, usually on its inferior and lateral portion, which is the remnant of the cicatrized umbilical blood-vessels.

Incarceration takes place very rarely, still Tréves and others have reported successful operations for such accidents. As there is a predisposition to the development of this variety of hernia, so there is a tendency towards spontaneous recovery. The round umbilical aperture will normally change after a number of months, or even a year, into a narrow fissure, more fat will develop, the muscles will become stronger, and then the intestine will be retained within the abdominal cavity.

It is desirable to retain the contents of the hernial sac inside the abdomen. For this purpose, trusses are very unavailing. Strips of adhesive plaster will serve very much better, but in most cases they are objectionable because they irritate the sensitive skin of the baby.

Whatever application is made to the hernia directly must be larger than the aperture. It should not be too hard. Linen compresses, or such of woven lint, plates of cork covered with linen or lint, may be applied and held in position by means of a bandage. Knitted bandages will suit better than the ordinary bandage of linen, cotton, or flannel.

Inguinal Hernia.—This is mostly external and congenital, but is seldom seen immediately after birth. The processus vaginalis peritonei remains open, beyond its normal time. Thus the intestine will slip into the scrotum, and down to the free surface of the testicle. In the female the inguinal canal (*canalis ligamenti rotundi*) which is to receive the round ligament, allows the intestine, in very rare cases the ovary also, to slip in.

The hernia shows itself as a soft mass, spherical, appearing in, and in front of, the inguinal ring, and gradually descends. It is very apt to reduce spontaneously, and just as apt to reappear. The testicle is always found above and behind it. The hernia will gradually increase in size, and sometimes is surrounded by liquid which descends with it. This complication of hernia and hydrocele in the young infant, is very rare. Sometimes the hernia will adhere to the testicle, and then become irreducible.

The predisposition to the formation of this variety of hernia is produced by the shortness and straightness of the inguinal canal in the foetus and the new-

born, also by the fact that the testicle descends sometimes too late or has not descended at all at birth.

Particularly, is it the right testicle which is liable to descend late, and the infantile inguinal hernia is mostly seen upon the right side.

Its proximate causes are straining in screaming, cough, constipation, phimosis, and fissure of the anus.

The diagnosis is made by the gurgling sound in the protruding mass, by its opaqueness, its tympanitic percussion note, and, as a rule, by its easy reduction. Its diagnosis from hydrocele of the spermatic cord, is made by the fact that the latter is a more or less immovable body, seldom extending to near the inguinal ring, and seldom into it, and is not known or liable to increase in size suddenly.

In most cases the hernia is easily reduced. There are, however, quite a number on record in which incarceration and strangulation rendered operative interference necessary. The operation should not be delayed, after it has been demonstrated that reduction was impossible while the patient was under the influence of an anæsthetic. In one case Rees succeeded in reducing a hernia after aspirating the intestine and removing a quantity of turbid liquid. It is certain, however, that this practice should not be recommended for general adoption.

Inguinal hernia in the newly-born is apt to recover spontaneously. When the short straight inguinal canal becomes longer and more oblique, in the

course of a few years, as the amount of fat increases, the rupture may disappear, but these predisposing factors have never succeeded in effecting a cure by themselves. I have seen a great many cured, but only when the hernia was retained inside of the abdominal cavity completely and constantly. These babies must wear a truss for several years. It must not be removed except when they are sleeping quietly. Trusses are uncomfortable in the beginning, they may give rise to cutaneous irritation, and so much the more is it necessary to keep the truss clean, and to select the one which, while it does not press too hard, will not prove too feeble.

Femoral hernia.—This is exceedingly rare. I have seen but few cases. St. Germain reports a case of incarcerated femoral hernia, in a girl eleven years of age, on which he operated successfully.

Median abdominal hernia.—This occurs in the linea alba, and is the result of small apertures remaining from the embryonic abdominal fissure.

Lateral abdominal hernia, I have not seen in children. In the adult they are not only the result of trauma, but also of an overstrain of the edge of the muscles, generally the rectus.

Ischiadic hernia is mostly found at the edge of the pyriform muscle. It takes a layer of fascia along, and is found with the superior gluteal artery, which lies behind the hernia, between the ligamentum tuberoso-sacrum and spino-sacrum. The ischiadic artery and

nerve are found posteriorly and below, and are separated from the hernia by the pyriform muscle. There is no treatment for this variety except to give it protection. It is found in the line between the trochanter major and the symphysis sacro-iliaca, and is covered by the glutæus maximus muscle. In most cases it is congenital. I have seen two, in both of which the hernial tumor hung suspended from the nates. It has been mistaken for cyst, and for fœtus in fœtu.

Most of the (external) herniæ which are found in the adult are not preformed congenitally. The internal herniæ are always preformed in the fœtus.

Perineal hernia, has lately been the subject of a thorough essay by L. Ebner, in D. Zeitsch. f. Chir., vol. xxvi, Aug. 5, 1887. He arrives at the following conclusions: Perineal hernia has a congenital predisposition, and is never of traumatic origin. The cavity between rectum and bladder (or uterus) is deeper and more marked in the embryo than in later life; this feature of the cavity persisting, gives rise to the predisposition mentioned above. The size and depth of that cavity is not equal in all embryos. The hernial contents descend in the upper part of the median line; in the lower part only a deviation takes place to either the right or left. Perineal hernia protrudes through either of the two fissures, one of which is between the levator and ischiococcygeus, the other between the ischiococcygeus and coccygeus muscles. These fissures can be demonstrated in the human

perineum quite frequently. All the herniæ occurring about the lower pelvic aperture are but varieties of the same class. The perineal herniæ of the dog are protrusions of the rectum—without any hernial sac—through the large fissures in the levator ani. The same occurrence is observed in man, and results, as it does in the dog, from habitual constipation.

The internal herniæ owe their existence to a congenital disposition. Orth (Lehrb, d. spec. pathol. Anat. I. p. 872) enumerates the following localities in which a hernia can take place:

Bursa omentalis.—A large peritoneal pocket, which is connected with the main peritoneal cavity through the foramen Monroei between the lig. hepato-duodenale and duodeno-renale, at least during childhood.

Fossa duodeno-jejunalis.—Located in the beginning of the mesentery, is open superiorly, is adjacent to the vertebral column, sometimes all the way down to the promontory. Small intestine only, but almost all of it, can protrude through it.

Fossa subcæcalis.—On the median line of the cæcum and is formed by a peritoneal fold extending from promontory to cæcum.

Fossa intersigmoidea.—On the inferior aspect of the mesocolon of the flexura iliaca.

The herniæ formed by the locking up of intestinal convolutions in any one of the three last named fossæ is always retroperitoneal.

Small pockets, facilitating the origin of internal herniæ, are also found in the fossa ischiadica. Besides, Klebs describes a congenital hernial sac which exists in the plica vesicalis posterior, a semilunar duplicature stretching from the posterior wall of the urinary bladder in the direction of the sacro-iliac articulation.

Diaphragmatic hernia in the newly born always takes place in the left half of the diaphragm. Part of the intestines protrude into the thoracic cavity; how large a part, or whether the stomach participates in the change of position, depends on the size of the aperture and the mobility of the abdominal contents. As a rule the mesocolon and mesentery are but short in the newly born. In a case of Ahlfed's the newly born screamed immediately and loud, and became cyanotic in the bath. The heart sounds, audible on the left side, were slow; the attempt at relieving the cyanosis (catheterization of the larynx, etc.) failed; soon the heart sounds were heard in the median line, then on the right side, and the apex beat in the right axilla. Tympanitic percussion sound extended all over the left side of the thorax. Death after $1\frac{1}{2}$ hours. •

There was evidently but a small opening in the diaphragm, and a moderate amount of mobility of the abdominal contents. In a case of mine the baby cried lustily once or twice while passing out of the vagina, became cyanotic at once, gasped a number of times,

and was dead after a few minutes. There was a large aperture, the left lung but a rudiment and the whole left side of the thorax was filled with part of stomach and intestines. In another case (Dr. Molony's) the baby lasted some days. We made the diagnosis by the cyanosis, the tympanitic percussion sound on the left, the displacement of the heart to the right, and the violent, more than croup-like, recessions—with every inspiration—of the præcordial region.

INFLAMMATION OF THE RECTUM—PROKITIS.

Catarrh and inflammation of the rectum are not very rare, though genuine uncomplicated inflammation is not found very frequently. Now and then we see it in connection with the pressure produced by obstinate constipation, occasionally by foreign bodies, and it may result in ulcers, of fibrous hyperplasia, or polypoid excrescences. The surface is then covered with a muco-purulent secretion. The surrounding cellular tissue is very frequently also the seat of infiltration and hyperplasia, for the larger part of the rectum is not covered by peritoneum.

In this way a peri-proktitis is developed, which is apt to result in abscesses. Such an abscess gives rise either to incomplete (internal or external), or to complete fistula. Not always, however, is peri-proktitis the result of a proktitis. Sometimes it will be due to pyæmia, sepsis, or severe cases of typhoid fever.

DYSENTERY.

It is found sporadic, endemic, and epidemic. It occurs mostly in the latter weeks of summer and in the early part of the autumn, and in warm, moist weather. It is certainly contagious, and may be transmitted by soiled clothing, towels or water-closets. Whether drinking water, raw fruit, and uncooked substances in general carry the contagion, is not absolutely proven.

Dysenteric inflammation of the rectum varies in its degree of intensity and its extension. Sometimes it extends over the whole surface of the colon into the small intestine.

It may be of a catarrhal, follicular or diphtheric nature. There is always swelling and local hyperæmia, and a secretion of mucus, pus, and blood. There is necrosis of the tissue, which breaks down and forms small or large abscesses and ulcerations.

Its different forms will change into each other and show different degrees of severity. It is sometimes found on the elevations of the mucous membrane only, and sometimes there are changes all the way down to complete necrosis of the tissues with perforation.

As a rule, the affection is more uniform in children, who form the large majority of cases under observation. Still the process will extend to the muscular layer and to the serosa, both of which may become thickened and œdematous. The lymph follicles will become affected and may ulcerate. Loss of substance is very frequent. The mucous membrane will become undermined, and large portions will be destroyed. Thus the ulcers will sometimes be small and now and then very large indeed. When necrosis takes place, there may be atrophy of the mucous membrane with local or general cicatrization, with loss of the glands; sometimes the formation of cysts, developed from the remains of glands.

The mesenteric glands are, as a rule, affected. In the beginning of the disease they are swollen and hyperæmic; later on swollen and hyperplastic. The spleen, in acute cases, is generally swollen, soft, and dark colored. The kidneys are in the first stage of inflammation with albuminous urine. The lungs are congested; sometimes inflamed. The liver is now and then the seat of abscess.

Symptoms.—There are cases which begin with very little fever, and mild symptoms in general, in which tenesmus is intermittent or is absent altogether, and there are some in which there is very little pain. But the largest number behave differently: there is generally fever, sometimes to such a degree as to result in convulsions, much pain in the left

hypochondrium; thirst; the tongue and lips are dry; straining, and frequent passages which contain only small quantities of fæces, and more mucus of the sago character.

The passages are not very offensive in the beginning, are alkaline, but occur from ten to forty or more times daily. Soon they contain pus, immense numbers of micro-organisms, of the same kind as are found in normal fæcal evacuations. The relief afforded by an evacuation is but temporary, and the movements follow each other with great frequency. The abdomen which was not very much inflated in the beginning, now begins to swell, tenesmus is constant, pain is severe, and blood appears in the stools. Diphtheritic deposits and broken down mucous membrane will follow. The children will exhibit the expression of intense suffering; will emaciate very rapidly; lie apathetic. The temperature at that time will fall sometimes below the normal. The heart becomes feeble, and in consequence dyspnœa will appear, also cough and pulmonary atelectasis. The anus will be excoriated. The sphincter ani will be softened and paralyzed, and thus a prolapse, sometimes of a large portion of the rectum, will take place to such an extent that extensive ulceration becomes visible. When this condition is reached the children are very apt to die. During the whole sickness there is but little secretion of urine, which has a dark color, and albuminous.

Recovery, as a rule, is very slow, particularly as the complications and consecutive diseases are very numerous. The lungs and the kidneys are in a condition of congestion or inflammation. The spleen is enlarged, and scurvy may be observed. Peritonitis will take place more readily in extensive dysentery than in acute enteritis. Perforation will, not infrequently, be the result of deep ulceration. Pyæmia may follow suppurative processes. Abscesses of the liver are not very infrequent in severe epidemics. In full convalescence, even after apparent recovery, paralysis of the lower extremities may appear.

Thus the prognosis, while it is favorable enough in very mild catarrhal cases, is always doubtful, and in protracted and diphtheritic cases is bad.

Treatment.—It is always best to empty the bowels first. Castor oil will suffice. A dose of calomel, 2 to 10 grains, according to age of child, will do well. Where there is a tendency to vomiting it is not necessary that the calomel be swallowed; placed dry upon the tongue it will there be changed into an albuminate and absorbed with favorable results.

Where the pain is very severe in the left hypochondrium and the child vigorous, an ice-bladder is to be applied for a short time; anæmic children do not bear it. In them, once for all, warm applications are preferable. Warm injections must be given very frequently for the purpose of washing out the rectum

and that part of the colon which can be reached. Opium may be added to the fluid injected. Altogether, opium is tolerated better in this form of rectal inflammation than in any other form of inflammation of the bowels, similar to what is known of its use in peritonitis. Thus a child of two or three years, may receive the equivalent of $\frac{1}{4}$ of a grain of opium in a very warm injection, a number of times daily. A two-third per cent. solution of salt water is preferable to pure water. A saturated solution of boracic acid, or boracic acid from one to two parts in a hundred of warm water, is mild and will act as an anti-fermentative. It need not be feared that much absorption of opium or boracic acid will take place, for the inflamed and ulcerated condition of the mucous membrane does not permit it to occur. Where the introduction of the syringe is very painful, it will be well to use a small quantity of cocaine in solution, of the strength of from 2 to 8 per cent.; where the tenesmus is very severe, small pieces of ice may be introduced into the rectum repeatedly. Where prolapse of the rectum exists, I have often applied a rather concentrated solution of morphine on the inflamed ulcers and prolapsed portion; also have used a strong solution of cocaine and applied it in the same way.

The treatment of acute dysentery requires opium, as stated above, in larger doses than are usually given in diseases of infancy and childhood. A child of two years of age may safely take $\frac{1}{20}$ of a grain of

opium every two hours, with four to six grains of sub-carbonate or subnitrate of bismuth. The amount of food must be very small. It must consist of boiled milk, with or without mucilaginous or farinaceous admixture. Stimulants must not be given in the beginning. Absolutely nothing that is solid, and surely nothing which is cold.

Chronic dysentery has been spoken of under the head of chronic intestinal ulceration.

POLYPUS OF THE RECTUM.

Polypi of the rectum are tumors of the size of a pea up to that of a cherry or hazelnut, or more. They are single or numerous. In one patient, besides one of large, and a few of smaller size, I met with two dozen of quite small ones, of the size of a French pea, or less. They are either quite soft, or more frequently of greater consistency, composed mostly of cells or cellular tissue, quite vascular, contain often a harder adenomatous nucleus, and a Lieberkuhn gland imbedded. They are either pedunculated or sessile, on a broad base. St. Germain is in error, when he thinks they are all pedunculated. They are sometimes found between the two sphincters, mostly above and near the inner sphincter, not infrequently, however, all over the middle portion of the rectum, and sometimes quite near the so-called third sphincter. They were first described by Stoltz, in 1831 (*Jour. f. Kind*, xxxiv, p 393). One of the latest writers on diseases of children, Eustace Smith, says they are rare in children under ten years of age. Bokai found them 35 times in 65,790 patients, that is once in 2,600. In my clinic, among 500 patients, I see from one to three cases annually; during the thirty years of my former

family practice, and also in the course of the last half dozen years, I met with the same number annually, most of them being office patients presented for some of the prominent or threatening symptoms, connected with the ailment. Thus, I feel certain that I meet with three or four cases every year, and have observed and treated about one hundred cases altogether. The children were mostly from one to seven years old, the majority between two and five. A few were less than a year old. Many of them looked pale and puny, others robust and vigorous. Amongst the symptoms are: irregular defecation; in some, constipation, in others, diarrhœa, occasionally in alternation; sometimes colic; discharge of mucus; and, when the polypus is very near the internal sphincter, or between the two sphincters, tenesmus; a groove in the fæces (a rare symptom in children, because in most cases the fæces are not hard); the appearance in or outside the anus, during a movement from the bowels, of a red body which rarely remains outside, and is mostly drawn into the rectum after defecation has been completed; and repeated hæmorrhages. These furnish a teaspoonful, more or less, of clear unmixed blood, that is discharged by itself, or with fæces. In the latter case, it hardly ever mixes with the fæces, but lies on top of them like hæmorrhoidal blood. This repeated hæmorrhage is almost conclusive evidence of polypus in the rectum. For but once in my life have I seen blood coming from a varicosity

round the anus, and never have I felt the temptation to diagnosticate premature menstruation (as has been done) because there was blood in the chamber. When the blood is seen as described, the diagnosis is best made certain by examination of the rectum. The sphincter and rectum, as long as they are normally developed, admit readily the index finger, and in most cases, but by no means all, the presence of a polypus is made out quite easily.

Polypus is found together with rectal catarrh. It has therefore been assumed to be the result of chronic catarrh. Why that should be so, I do not perceive. When there is a nasal polypus and catarrh, the former is not taken to be the result of the latter; on the contrary, the latter may be the result of the former; particularly is that probable in the rectum, where most polypi have pedicles, at least after a certain time, which allow of a great movability, thereby irritating the neighborhood. The pedicles are sometimes quite long and thin, sometimes to such an extent as to allow of their breaking spontaneously, thus facilitating unperceived removal.

Grave symptoms may be, a thorough anæmia from repeated hæmorrhages, or occasional nervous symptoms. Demme observed eclampsia in a five-year-old boy, which never returned after the removal of the growth.

The treatment has consisted, with some, in the employment of the cold, or galvano-caustic snare,

or evulsion by means of pincers or with the fingers. The growth is sometimes rubbed off, the pedicle offering but little resistance, or it can be rolled out into and through the anus; there a ligature may be applied, or it may be caught in pincers, and the whole undergo torsion and evulsion. I have never hesitated to break the pedicle with my finger inside, and roll out the growth. The bleeding has been but very trifling, but I ought to add, that some authors have seen hæmorrhages, and therefore advise the ligature of the pedicle before the polypus is torn off or cut away. When it cannot be found, it is necessary to wait for the next passage which will roll the polypus out. Sessile polypi may not be found easily, but they do not give rise to very urgent symptoms. The astringent injections which are to remove them must be mild; solutions of 1 per cent. of alum, repeated often, will be found sufficient. I know of many cases in which sessile papillomata would thus gradually shrink.

PROLAPSE OF THE RECTUM.

Prolapse of the anus and rectum is the consequence of catarrhal and inflammatory irritation and softening. It will follow chronic catarrh and dysentery. It is produced by debility of the sphincter, which is often congenital, sometimes the result of neighboring diseases; also due to drastic purgatives, or constipation with the incidental straining. Such straining resulting in prolapse, is also produced by the presence of polypus or worms in the rectum, by stone and catarrh of the bladder, and phimosis. A predisposition arises from the peculiar shape of the rectum in the young. It is straighter, inasmuch as the sacrum is not scooped out as it is in the adult.

The rectum is aptly divided into three parts. The upper part extends to the insertion of the peritoneum; the lower division consists of the sphincter with its strong circular fibres; and between these two is the third or middle portion not covered by peritoneum but imbedded in large masses of connective tissue.

Prolapsus of the rectum is not always uniform.

It is not always the entire mass of the rectum which protrudes, but only one side of it, just as prolapse of the vagina may be only partial.

The condition is easily recognized. Spontaneously, or after defæcation, a soft, red, bloody, or purple mass will make its appearance, and return after defæcation spontaneously, or remain outside and is easily replaced. The secretion of the surface is mucous, sometimes bloody. Most of the cases present the prolapsus like a ball, and when they are large will be elongated like a sausage. There is no aperture in most of the swellings. When there is, we have to deal with a more severe form, a real invagination of the rectum.

When the sphincter is very flabby and semi-paralyzed, gangrene will seldom occur. When, however, the sphincter is still vigorous, and the case is one of invagination, partial or total gangrene may take place, for the same reason that gangrene will appear in every intussusception higher up, when the intestine is doubled upon itself.

Treatment.—Temporary reduction of the prolapsus is readily accomplished, particularly in such cases as those in which the sphincter is feeble, but the intestine will come down again. Attention must be paid to defæcation. The children must not be allowed to strain. Thus the chamber must be placed in such a position (raised to such an extent) that the feet cannot touch the floor.

Hippocrates has the following remark: "In children suffering from stone, and protracted genuine dysentery, the rectum is apt to protrude. It should be pressed in with a soft sponge, and touched with a snail. Then the patient should have his hands tied, and be suspended a short time, and thus the rectum will slip in. If it comes down again, a band should be placed around the loins; a bandage must be attached to this, and the rectum, after being moistened with a decoction of lotos, be replaced with a soft sponge. Also the intestine must be washed with this decoction and the bandage carried up between the legs to the umbilicus. During defæcation the baby must sit with extended legs upon the feet of the mother, its body leaning against her knees."

Many appliances have been devised to retain the rectum inside. Adhesive plaster has been used as best it could, and a number of instruments have been invented for the purpose of retaining the rectum in position, while leaving an opening for the passage of the fæces. They have been made of hard rubber, lead, and other materials. Others have used a tampon, and some a compress, to hold the nates together; but a tampon will certainly dilate the paralyzed sphincter more than it was before. Curling confines his efforts to compressing the nates.

The main attention must be given to the treatment of the constipation, or the diarrhœa, the local catarrh, the rectal worms, the presence of polypi, the

occurrence of stone in the bladder, of phimosis, and all causes of straining and prolapse which have been enumerated above.

But there are direct indications which can be fulfilled. Astringents have been used locally in the form of injections, alum and tannin principally, in solutions of one or two per cent. Ice has been applied directly, and ice-water injections can be used with advantage three or four times a day in small quantities—half an ounce to an ounce. One enema must be given daily for the purpose of emptying the colon and avoiding the possible straining.

In most cases there is considerable swelling, sometimes real hypertrophy of the mucous membrane and of all the tissues. Then the prolapsus must be treated for the purpose of reducing its size. A part of the hypertrophied tissues has been excised, as is now being done in the vagina, either by the knife or the ecraseur. Caustics have been used. Nitrate of silver, in substance, to be carefully neutralized by chloride of sodium in solution, immediately after the application. Concentrated nitric acid has been employed for the purpose of destroying some of the superfluous tissue. The best remedy, however, for this purpose, is the actual cautery. It should be applied either in long welts or stripes, or at half a dozen or a dozen points. It matters not whether the galvano-cautery, or Paquelin's thermo-cautery, or the common actual cautery, is used.

For the purpose of strengthening the sphincter, I have used frequently, for dozens of years, an ointment consisting of extract of nux vomica one part, in ten or fifteen parts of fat, to be applied to the lower part of the rectum from three to five times a day, or every time the bowel protrudes. The internal administration of strychnia is of very little avail; but that of ergot is serviceable. The subcutaneous injection of strychnia (sulphate gr. $\frac{1}{60}$ to $\frac{1}{30}$, dissolved in water), once daily in the neighborhood of the sphincter, will be beneficial, particularly when supported by the action of the interrupted electric current, which may be applied for a few minutes, once or twice every day.

FISSURE OF THE ANUS.

Fissure is reported to be a disease in infants and children. Bokai, Esmarch, and St. Germain in his recent work on the Surgery of Childhood, are agreed on that point. Daniel Moliere in his Diseases of the rectum, p. 155, expresses the same opinion, reporting but a slim literature on the subject, and quoting Ducloz, Allingham and Miller as his authority.

A. B. Kelsey in "Diseases of the Rectum and Anus," N. Y., 1884, p. 267, has but a brief note on the occurrence of fissure in children. In it he refers only to Kjellberg, who emphasizes the fact that it is much more frequent than is generally assumed. Kjellberg's figures are as follows: 9098 children were presented in the Dispensary of Stockholm; in 128 there was fissure of anus; 60 of the patients were boys, 68 girls; the majority were less than a year old, 73 less than four months. Thus, only Kjellberg claims that fissure is frequently found in the first year of life.

When the nates are gently parted, fissure is not visible, or but rarely so. Pulling harder upon the anus, to the right or left, it becomes perceptible as a narrow cut, red and clean, or sometimes grayish, and

ulcerated, one-half, two, or even five, lines in length. Very seldom does it extend beyond the sphincter. Handling it as described a little blood may ooze out, but there is never much loss of blood. The slightest touch is exceedingly painful. The surrounding skin is wholly normal, and the anus itself on anything but very close inspection looks so healthy that the fissure is very often overlooked altogether. On examination, however, not infrequently a contraction of the neighboring part takes place. It is partly voluntary, partly spasmodic. Thus, while the two, that is, fissure and contraction, are frequently seen together, it must be borne in mind that a fissure may occur without the contraction, and *vice versa* a dynamic contraction without a fissure.

There is a milder type of fissure which is not confined to the sphincter part of the anus. On a surface near the anus, more or less hyperæmic, there are slight erosions, and ulcerations, with superficial epidermic and cutaneous cuts. They may be the result of the rhagades of congenital or acquired syphilis, or of local erythema and exanthema, of vulvo-vaginitis, of eczema or herpes. Other causes, particularly of the more severe form, are foreign bodies, such as stones passing and injuring the sphincter. Constipation such as depends on the exaggerated length of the sigmoid flexure is apt to produce it. So are other causes of constipation, as for instance improper diet, and the congenital narrowness of the rectum. A somewhat

different form depends on the congenital contraction of the sphincter; in this case the rectum becomes dilated above, fæces accumulate and become exsiccated, and their final passage results in both pain and injury. When once established, the fissure remains, the alternating contraction and expansion, and the contact with fæces, rendering recovery impossible. But it cannot be said too often, that it is sometimes very difficult to discover it, and that whosoever means to find, must have learned how to look for it. As a rule, it is found posteriorly in the median line.

The pain at defæcation is very intense. Thus the patient has a mortal fear of moving his bowels. Voluntary constipation is the uniform result. It makes the case worse, screaming attends every evacuation, which is sometimes tinged with a trace of blood. The pain may last hours after the act, slight pressure on the parts is also painful, thus a peculiar expression of anguish and exhaustion may distort the haggard-like face. The results of the voluntary (and partly involuntary, through the reflex contraction of the sphincter) constipation will soon show itself, such as tympanites, gastric and umbilical pain, indigestion, sleeplessness, and cerebral irritation. I well remember the case of a little boy of two years whom I knew some ten years ago, whose pain did not return after a single forcible dilatation of the sphincters, and whose emaciation and anæmia improved from that very hour, not to return.

The morbid symptoms do not belong to the intestinal tract alone. Spasm of the neck of the bladder is quite frequent, and may give the impression of vesical calculus. Frequently have I had opportunities of emphasizing the fact that many of the emaciating colics of infants do not belong to the intestine—where, it is true, most of them are located—but that dysuria on the basis of renal calculi is not rarely the cause of the screaming spells lasting half and whole hours. Now, some of them, though attended with dysuria, have no primary seat in the urinary organs, but are due to fissure of the anus, which will explain the case when looked for and discovered.

Not in all cases, however, is there dysuria. Incontinence may take its place, but then it is an incontinence not of the usual paralytic character, but will appear in small quantities, and with more or less tenesmus.

In some infants and small children the local symptoms are less prominent. They are presented with the following history: They have not been well for some time, are not thriving, emaciate somewhat, cry a good deal, are restless for hours in bed, do not care to be taken up, scream quite suddenly, have frequently stools of normal or somewhat hard consistency, small in bulk, no diarrhœa, and cry while they have a movement. When you gather the fæces of the many evacuations, they are about the normal daily quantity or less. The children are fretful, eat but



indifferently, and sleep interruptedly. Of such patients many had a fissure, and I have seen a goodly number of that class.

A child was brought in from one of the large cities of the West by her father, himself a physician. She was five years old, had not enjoyed a well day for years. She had frequent stools, part of which were attended with excruciating pains. Many, however, were quite easy, a great many were bloody. On closer examination of the history I learned that the painless evacuations consisted of clear blood only, a teaspoonful or more at a time. The fæculent discharges were always painful, were rather hard, and came away in lumps which now and then were slightly streaked with blood. From these points I could make my diagnosis, I thought. The blood must come from the presence of a polypus, or polypi. The excruciating pain was likely the result of an anal fissure. I laid the child over the knees of the father, found a median posterior fissure, introduced the index finger high up into the rectum, met a polypus of the size of a large cherry, pulled it out and tore it off; introduced the index finger again, and also that of the left hand, dilated until I felt a slight grating sensation, and withdrew them. A few teaspoonfuls of blood and plenty of fæces followed. The whole procedure took no more than two minutes. During that day there were a few more fæculent discharges with but little blood, with less pain than the

child had endured for years. The next day she felt nearly well, and for two days, and every day afterward she had no pain or ailment of any kind.

This complication of polypus and fissure is not frequent; I have seen but few of the kind. But fissures are frequent indeed, and not a rare cause of great suffering. The severe form is not often met with during the first year of life, but in the following years is more common. If I say that of the severest type I meet with half a dozen annually, I underrate rather than overestimate.

The treatment has consisted in the relief of occasional diarrhœa, and of the more frequent constipation, by enemata and mild purgatives, in the application of astringents, such as lead, copper, zinc, or alum; or of caustics, such as nitrate of silver (Esmarch), or of nitric acid. This treatment is painful and tedious. Boyer advised incision through the whole of the sphincters. The open wound may bleed and give rise to ulceration, or sepsis. The proper treatment consists in dilatation of the sphincters. Josseline directs it to be gradual, thereby protracting uncertainty and pain. The best and speediest method is forcible instantaneous dilatation without anæsthetia. The operation takes so little time that it is hardly required except in very puny or convulsive infants or children. The introduction of two fingers of the same hand is rarely sufficient, three or four do better. The easiest way is to use the two

index fingers; a sufficient dilatation is recognized by the distinct sensation that the muscular fibres have given way. The external wound is trifling, and but superficial.

In justice to a deserving author, I quote from Allingham's "Diseases of the Rectum," Phil., 1882, Ch. XV. He says: "In children and young persons, unless a polypus implicates the fissure, I think it is almost always curable without operation. In children suffering from hereditary syphilis, numerous small tracks around the anus are common, and they cause much pain. Mercurial applications and extreme cleanliness soon cure them, but they will return from time to time unless antiseptic medicines be taken for a lengthened period."

From this it appears that he has seen but the milder and more external forms to which I have alluded above.

Another mild form—at least, as far as the fissure is concerned—is one which I, personally, have met with but very seldom, but which, according to my friends Dr. J. C. Perry and Dr. J. Byrne, does not appear to be very rare. In this class of cases the fissure is complicated with a loose, dilated, and very dilatable anus. The symptoms belonging to this class are not of the severe kind described by me, and the application of the lunar caustic or Boyer's superficial incision is sufficient for a cure. This form is

more frequent in the adult woman, after repeated pregnancies, where the rectum is full of varicosities and affected by chronic catarrh, than in children.

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